User's Guide

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Avaya Wireless AP-3

AVAYA

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Introduction 1

In This Chapter

The following topics are covered in this section:

- Document Conventions
- Introduction to Wireless Networking
- IEEE 802.11 Specifications
- Management and Monitoring Capabilities

Document Conventions

- The term, **AP**, refers to an Access Point.
- The term, **802.11**, is used to describe features that apply to the 802.11a, 802.11b, and 802.11g wireless standards.
- A **Dual-radio AP** is an Access Point that includes two radios; it can support one or two IEEE radio standards (depending on the type of radios installed). The AP-3 is a Dual-radio AP.
- An **802.11a AP** is an Access Point that supports the IEEE 802.11a standard.
- An **802.11b AP** is an Access Point that supports the IEEE 802.11b standard.
- An **802.11b/g AP** is an Access Point that supports the IEEE 802.11g

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standard.

- Blue text indicates a link to a topic or Web address. If you are viewing this documentation on your computer, click the blue text to jump to the linked item.

NOTE:
A Note indicates important information that helps you make better use of your computer.

CAUTION:
A Caution indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

Introduction to Wireless Networking

An AP extends the capability of an existing Ethernet network to devices on a wireless network. Wireless devices can

- connect to a single Access Point, or
- move between multiple Access Points located within the same vicinity. As wireless clients move from one coverage cell to another, the devices maintain network connectivity.

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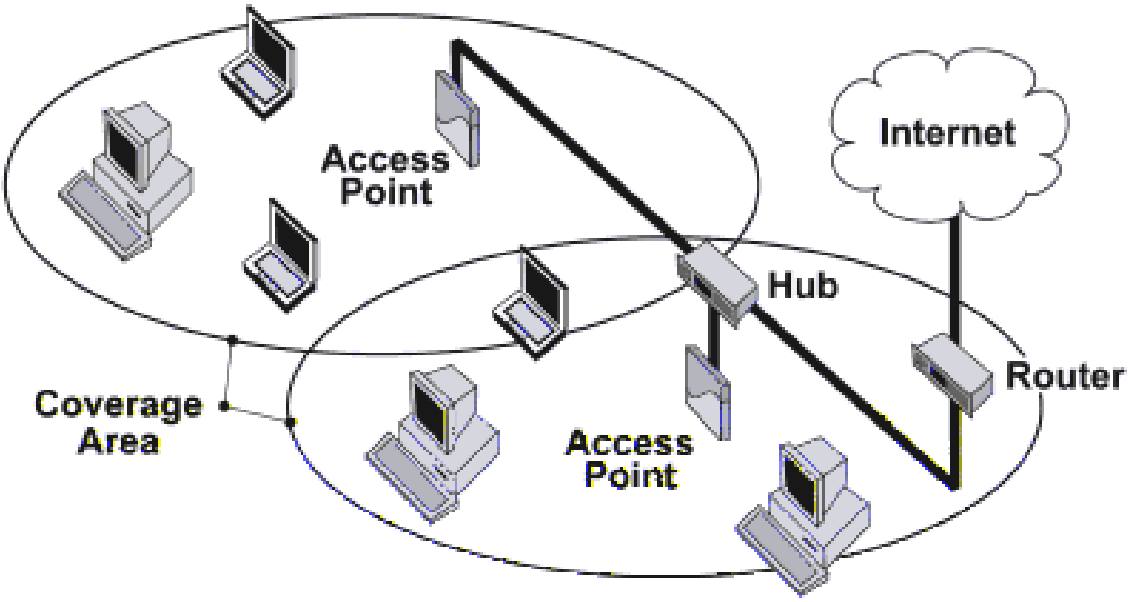
Site Survey

To determine the best location for an Access Point, Avaya recommends conducting a Site Survey before placing the device in its final location. For information about how to conduct a Site Survey, contact your local reseller.

Before an Access Point can be configured for your specific networking requirements, it must first be initialized. See Getting Started for details.

Figure 1-1. Typical wireless network access infrastructure



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Once initialized, the network administrator can configure each unit according to the network's requirements. The AP functions as a wireless network access point to data networks. An AP network provides:

- Seamless client roaming
- Easy installation and operation
- Over-the-air encryption of data
- High speed network links

To be fully operational, the AP-3 needs at least one wireless card installed.

Guidelines for Roaming

Wireless Standard Support

An AP can only communicate with client devices that support its wireless standard. For example, an 802.11a client cannot communicate with an 802.11b AP and an 802.11b client cannot communicate with an 802.11a AP. However, both 802.11b and 802.11g clients can communicate with an 802.11b/g AP.

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Network Names

- All Access Points must have the same Network Name to support client roaming.
- All workstations with an 802.11 client adapter installed must use either a Network Name of “any” or the same Network Name as the Access Points that they will roam between. If an AP has Closed System enabled, a client must have the same Network Name as the Access Point to communicate (see Interfaces).

Security Settings

All Access Points and clients must have the same security settings to communicate.

Cell Coverage

- The Access Points’ cells must overlap to ensure that there are no gaps in coverage and to ensure that the roaming client will always have a connection available.
- The coverage area of an 802.11b or 802.11b/g AP is larger than the coverage area of an 802.11a AP. The 802.11b and 802.11b/g APs operate in the 2.4 GHz frequency band; the 802.11a AP operates in the 5 GHz band. Products that operate in the 2.4 GHz band offer greater range than products that operate in the 5 GHz band.

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Data Rates

An 802.11a or 802.11b/g AP operates at faster data rates than the 802.11b AP. 802.11a and 802.11g products operate at speeds of up to 54 Mbits/sec; 802.11b products operate at speeds of up to 11 Mbits/sec.

Channels

- All Access Points in the same vicinity should use a unique, independent Channel. By default, the AP automatically scans for available Channels during boot-up but you can also set the Channel manually (see Interfaces for details).
- Access Points that use the same Channel should be installed as far away from each other as possible to reduce potential interference.

IEEE 802.11 Specifications

In 1997, the Institute of Electrical and Electronics Engineers (IEEE) adopted the 802.11 standard for wireless devices operating in the 2.4 GHz frequency band. This standard includes provisions for three radio technologies: direct sequence spread spectrum, frequency hopping spread spectrum, and infrared. Devices that comply with the 802.11 standard operate at a data rate of either 1 or 2 Megabits per second (Mbits/sec).

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802.11b

In 1999, the IEEE modified the 802.11 standard to support direct sequence devices that can operate at speeds of up to 11 Mbits/sec. The IEEE ratified this standard as **802.11b**. 802.11b devices are backwards compatible with 2.4 GHz 802.11 direct sequence devices (that operate at 1 or 2 Mbits/sec). Available Frequency Channels vary by regulatory domain and/or country. See 802.11b Channel Frequencies for details.

802.11a

Also in 1999, the IEEE modified the 802.11 standard to support devices operating in the 5 GHz frequency band. This standard is referred to as **802.11a**. 802.11a devices are not compatible with 2.4 GHz 802.11 or 802.11b devices. 802.11a radios use a radio technology called Orthogonal Frequency Division Multiplexing (OFDM) to achieve data rates of up to 54 Mbits/sec. Available Frequency Channels vary by regulatory domain and/or country. See 802.11a Channel Frequencies for details.

802.11g

In 2003, the IEEE introduced the **802.11g** standard. 802.11g devices operate in the 2.4 GHz frequency band using OFDM to achieve data rates of up to 54 Mbits/sec. In addition, 802.11g devices are backwards compatible with 802.11b devices. Available Frequency Channels vary by regulatory domain and/or country. See 802.11g Channel Frequencies for details.

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Management and Monitoring Capabilities

There are three management and monitoring interfaces available to the network administrator to configure and manage an AP on the network:

- HTTP Interface
- Command Line Interface
- SNMP Management

HTTP Interface

The HTTP Interface (also known as the Web browser Interface) provides easy access to configuration settings and network statistics from any computer on the network. You can access the HTTP Interface:

- over your LAN (switch, hub, etc.),
- over the Internet, or
- with a “crossover” Ethernet cable connected directly to your computer’s Ethernet Port.

Command Line Interface

The Command Line Interface (CLI) is a text-based configuration utility that supports a set of keyboard commands and parameters to configure and manage an AP.

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Users enter *Command Statements*, composed of CLI Commands and their associated parameters. Statements may be issued from the keyboard for real time control, or from scripts that automate configuration.

For example, when downloading a file, administrators enter the **download** CLI Command along with IP Address, file name, and file type parameters.

How To Access the CLI

You access the CLI over a HyperTerminal serial connection or via Telnet.

During initial configuration, you can use the CLI over a serial port connection to configure an Access Point's IP address.

When accessing the CLI via Telnet, you can communicate with the Access Point from over your LAN (switch, hub, etc.), from over the Internet, or with a "crossover" Ethernet cable connected directly to your computer's Ethernet Port.

See Command Line Interface (CLI) for more information on the CLI and for a list of CLI commands and parameters.

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SNMP Management

You can also manage and configure an AP using the Simple Network Management Protocol (SNMP).

NOTE:
This requires an SNMP manager program, like HP Openview or Castlerock's SNMPc.

The AP supports several Management Information Base (MIB) files that describe the parameters that can be viewed and/or configured over SNMP:

- MIB-II (RFC 1213)
- Bridge MIB (RFC 1493)
- Ethernet-like MIB (RFC 1643)
- 802.11 MIB
- Avaya Wireless Enterprise MIB

Avaya provides these MIB files on the CD included with each Access Point. You need to compile one or more of the above MIBs into your SNMP program's database before you can manage an Access Point using SNMP. Refer to the documentation that came with your SNMP manager for instructions on how to compile MIBs.

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The Enterprise MIB defines the read and read-write objects that can be viewed or configured using SNMP. These objects correspond to most of the settings and statistics that are available with the other management interfaces. Refer to the Enterprise MIB for more information; the MIB can be opened with any text editor, such as Microsoft Word, Notepad, or WordPad.

NOTE:
The remainder of this guide describes how to configure an AP using the HTTP Web interface or the CLI interface. For information on how to manage devices using SNMP, refer to the documentation that came with your SNMP program. Also, refer to the MIB files for information on the parameters available via SNMP.

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Getting Started 2

In This Chapter

- Prerequisites
- Product Package
- System Requirements
- Hardware Installation
- Initialization
- Download the Latest Software
- Additional Hardware Features

Prerequisites

Before installing an AP, you need to gather certain network information. The following section identifies the information you need.

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Network Name (SSID of the wireless cards)	Assign the Access Point a Network Name before wireless users can communicate with it. The clients also need the same Network Name. This is not the same as the System Name, which applies only to the Access Point. The network administrator typically provides the Network Name.
AP's IP Address	If you do not have a DHCP server on your network, then you need to assign the Access Point an IP address that is valid on your network.
HTTP (Web) Interface Password	Each Access Point requires a read/write password to access the Web interface. The default password is "public".
CLI Interface Password	Each Access Point requires a read/write password to access the CLI interface. The default password is "public".
SNMP Read Password	Each Access Point requires a password to allow get requests from an SNMP manager. The default password is "public".
SNMP Read-Write Password	Each Access Point requires a password to allow get and set requests from an SNMP manager. The default password is "public".
Security Settings	You need to determine what security features you will enable on the Access Point.

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Authentication Method	A primary authentication server may be configured; a backup authentication server is optional. The network administrator typically provides this information.
Authentication Server Shared Secret	This is a password shared between the Access Point and the RADIUS authentication server (so both passwords must be the same), and is typically provided by the network administrator.
Authentication Server Authentication Port	This is a port number (default is 1812) and is typically provided by the network administrator.
Client IP Address Pool Allocation Scheme	The Access Point can automatically provide IP addresses to clients as they sign on. The network administrator typically provides the IP Pool range.
DNS Server IP Address	The network administrator typically provides this IP Address.

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Product Package

Each Dual-radio AP comes with the following:

- One ceiling or wall mounting plate
- Mounting hardware
- Metal faceplate for APs mounted in a plenum environment
- AP cover
- Processor module (with integrated Active Ethernet, if applicable)
- Power supply (not provided with Active Ethernet unit)
- AC power cord (not provided with Active Ethernet unit)
- 802.11b PC Card or 802.11b/g AP Card
- One Installation CD-ROM that contains the following:
  - — Software Installation Wizard
  - — ScanTool
  - — Solarwinds TFTP software
  - — HTML Help
  - — this user's guide in PDF format
- One *Access Point Quick Start Guide*

If any of these items are missing or damaged, please contact your reseller or Technical Support (see Technical Support for contact information).

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5 GHz Antenna Adapter or AP-3 11a Upgrade Kit

The 5 GHz Antenna Adapter or 11a Upgrade Kit (used with software release 2.3) can be used in the Access Point. Because the 802.11a requires an antenna adapter, only one 5 GHz radio can be installed in the AP. The second slot can be populated with an 802.11b or 802.11b/g card.

System Requirements

The following are the minimum requirements to begin using an AP:

- A 10Base-T Ethernet or 100Base-TX Fast Ethernet switch or hub
- At least one radio card designed for the AP:
  - — an 802.11b PC Card,
  - — 802.11b/g Card,
  - — 5 GHz Antenna Adapter Kit, or
  - — 11a Upgrade Kit
- At least one of the following IEEE 802.11-compliant devices:

You will need an:	If you have an:
802.11a client device	802.11a AP
802.11b or 802.11b/g client device	802.11b AP
802.11b/g client device	802.11b/g AP

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- A computer that is connected to the same IP network as the AP and has one of the following Web browsers installed:

  — Microsoft Internet Explorer 6 with Service Pack 1 or later

  — Netscape 6.1 or later

  (The computer is required to configure the AP using the Web or HTTP interface.)

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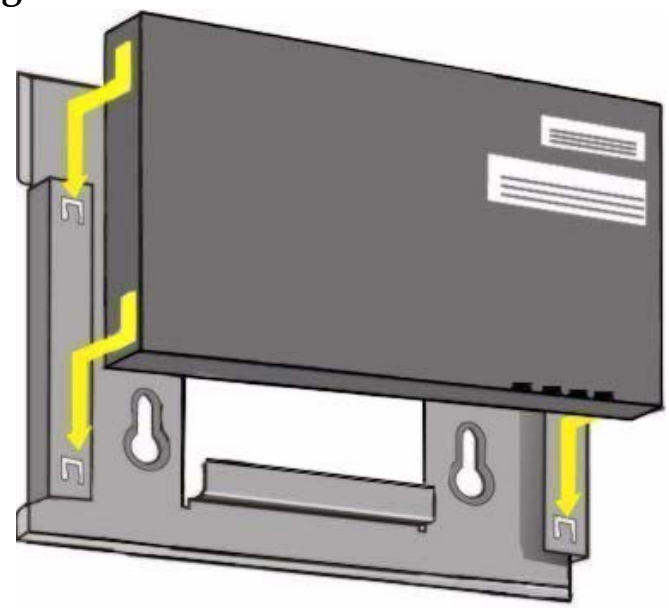
Hardware Installation

- AP-3 with Active Ethernet
- AP-3 with Power Supply
- 5 GHz or AP-3 11a Upgrade Kit

AP-3 with Active Ethernet

1. Slide the AP module onto the mounting bracket. Make sure it is properly seated.

Figure 2-1. Insert Module into Mounting Bracket



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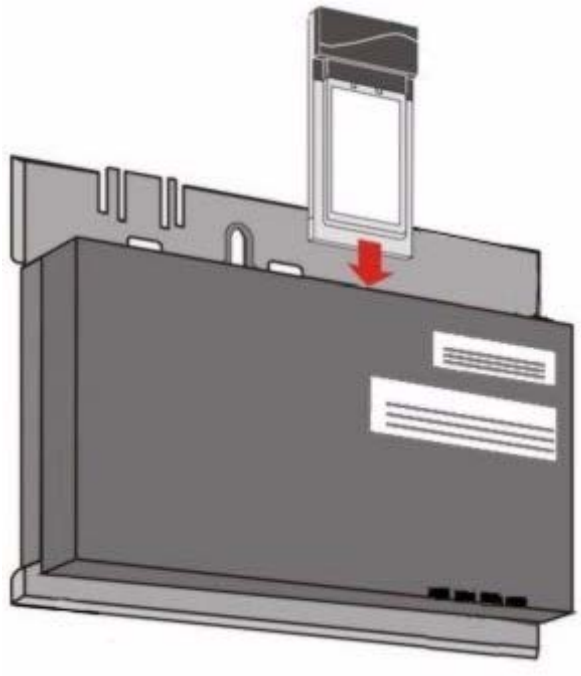
2. Slide an 802.11b, 802.11b/g wireless card, or 802.11a card with antenna adapter (not included in the kit) into Slot A or B.

NOTE:
The 802.11a wireless card with antenna adapter will only fit in Slot A.

3. Slide an 802.11b or an 802.11b/g wireless card (included in the kit) into Slot A or B.

Figure 2-2. Slide a PC Card into the AP



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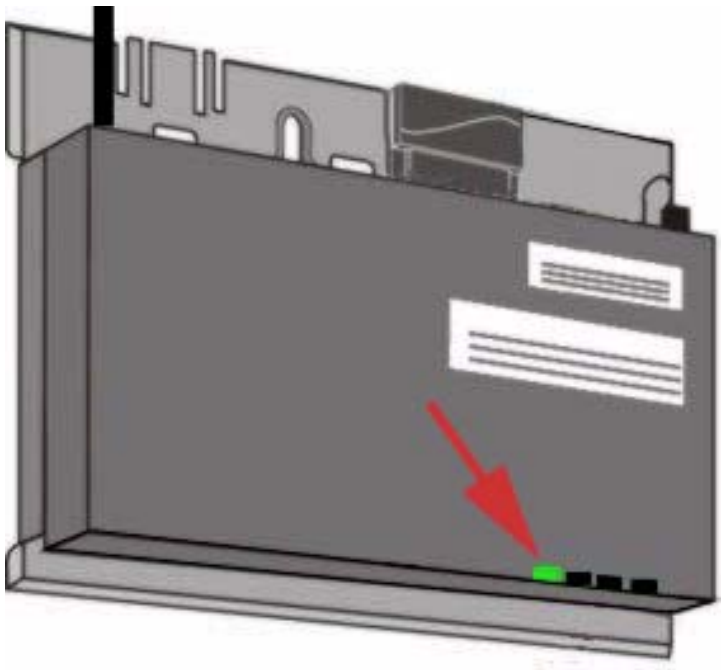
4. Connect power to the unit from a DC injector device, such as the Avaya Wireless 1-Port Active Ethernet DC Injector hub.
5. Wait for the LED indicators to turn green before proceeding.

Figure 2-3. Connect an Ethernet cable from an AE hub to the AP



6. Conduct a Site Survey to determine the best location for your device. If you need assistance, contact your reseller for help.
7. Once you have chosen a final location for your unit, mount the wall bracket and the processor module and place the cover onto the unit as shown.

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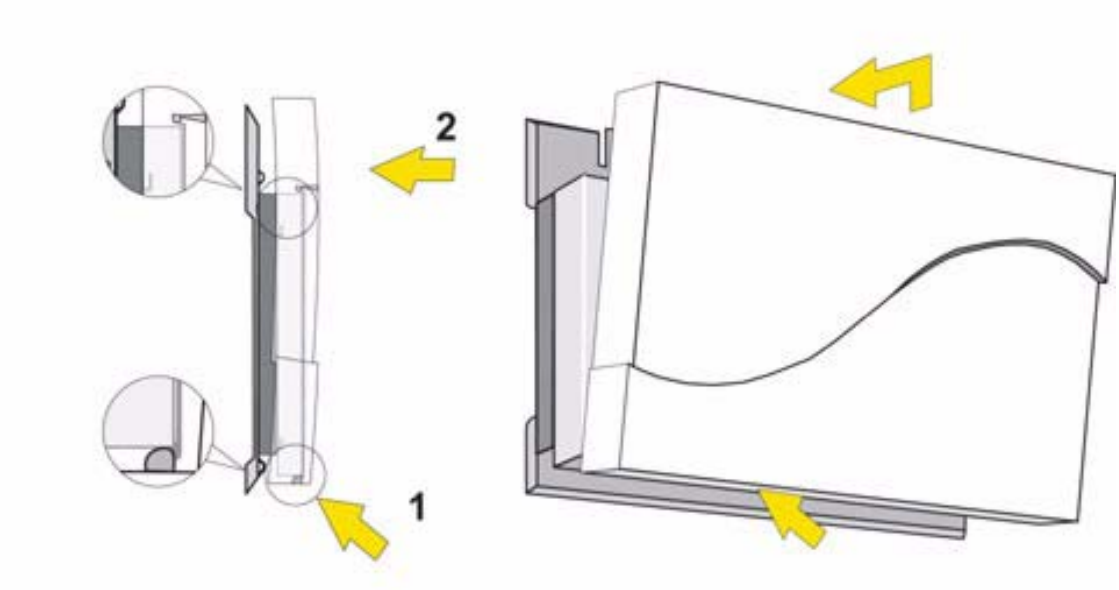
Figure 2-4. Wall mounting the AP



AP-3 with Power Supply

1. Clip the power supply into the mounting bracket.
2. Plug the AC power cord into the power supply.

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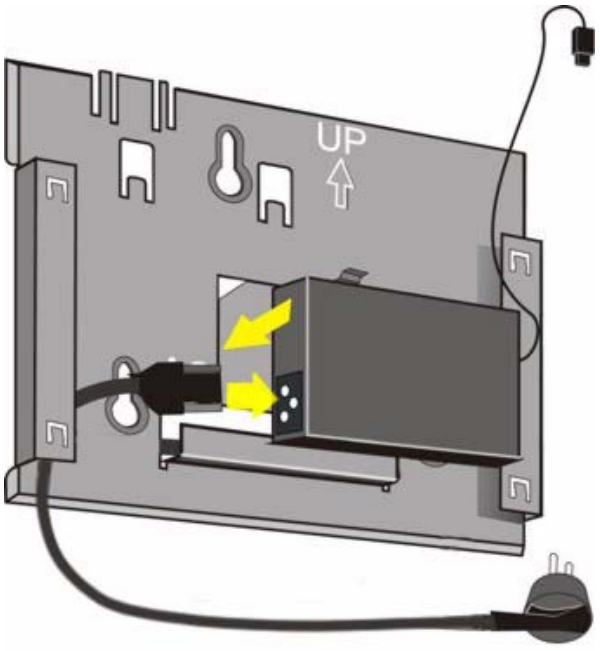
Figure 2-5. Install the power supply



3. Slide the AP module onto the mounting bracket. Make sure it is properly seated.
4. Plug the DC connector from the power supply into the top of the AP module.

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Figure 2-6. Insert module in mounting bracket and attach power connector

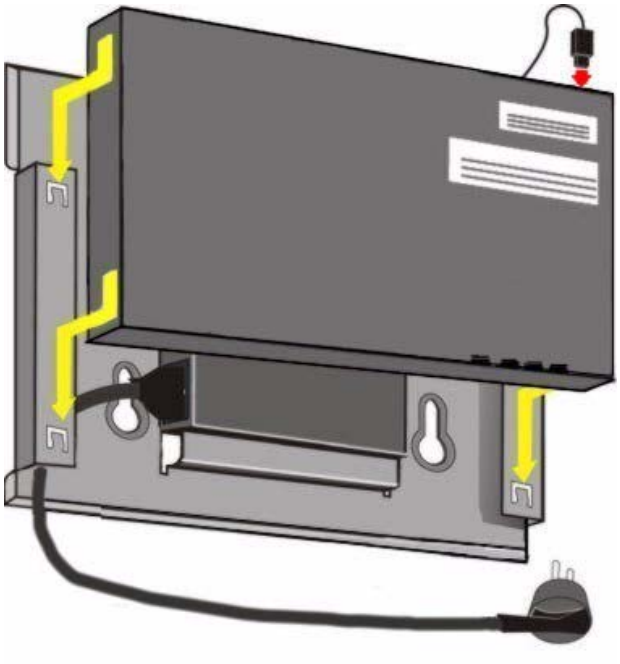

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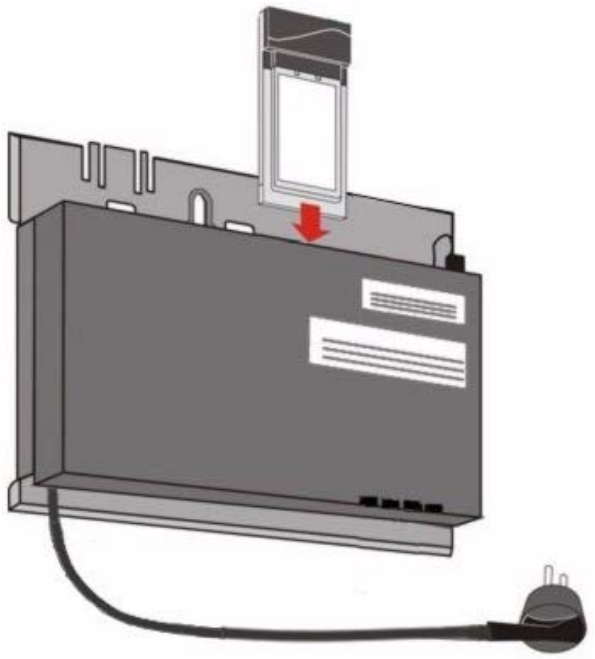
Figure 2-7. Slide a PC Card into the AP



5. Attach one end of an Ethernet cable to the AP's Ethernet port and the other end to a network hub or switch.
6. Connect the unit to a power source.
7. Wait for the power LED to turn green before proceeding.

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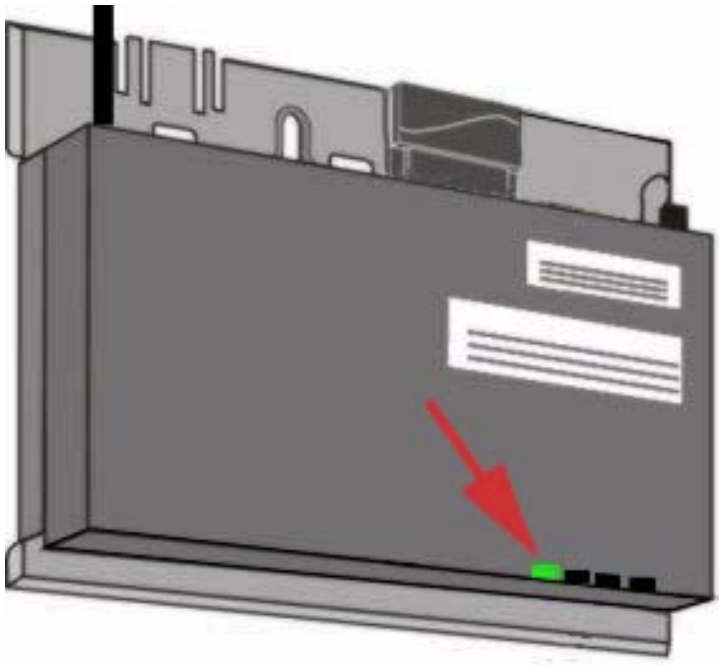
Figure 2-8. Power LED turns green when the unit is operational



8. Conduct a Site Survey to determine the best location for your device.
9. Once you have chosen a final location for your unit, mount the wall bracket and the processor module and place the cover onto the unit as shown.

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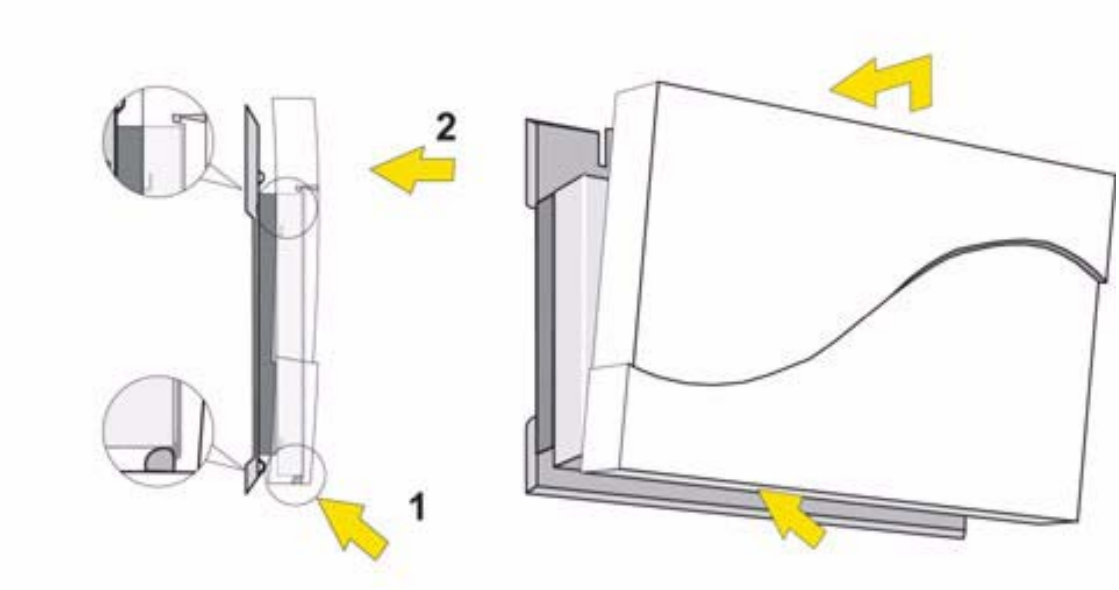
Figure 2-9. Wall mounting the AP



5 GHz or AP-3 11a Upgrade Kit

If you are installing this kit on a new AP (an AP that has not been installed yet), skip to Step 4.

1. Remove the AP from your network by unplugging the power and Ethernet cables from the unit.
2. Remove the unit from its mounting location - keep the mounting bracket with the AP.
3. Remove the outer plastic cover.

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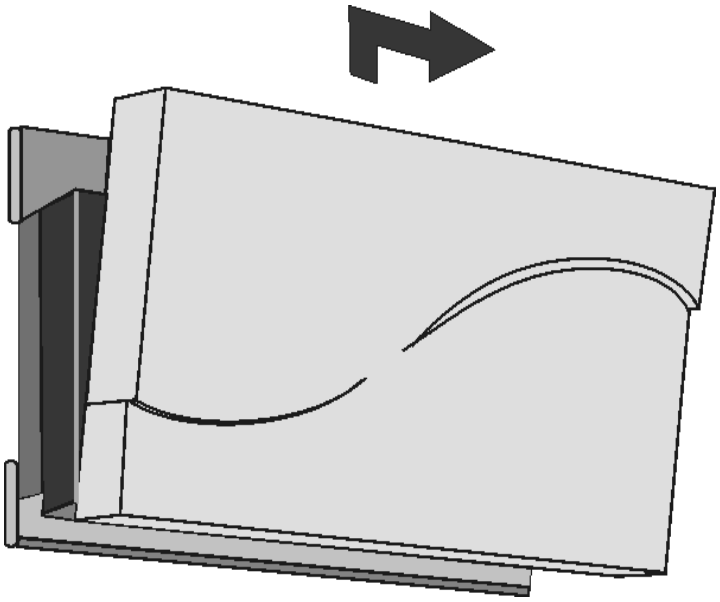
Figure 2-10. Remove the AP cover



4. Make sure you have at least one card slot available. The power or Ethernet cable tie wrap may need to be cut and the cable repositioned to allow the antenna adapter to fit correctly.
5. Position the antenna adapter, card inward, facing the top of the unit (see Figure 2-11 Insert Card and Antenna) and insert the 5 GHz card into the available card slot.

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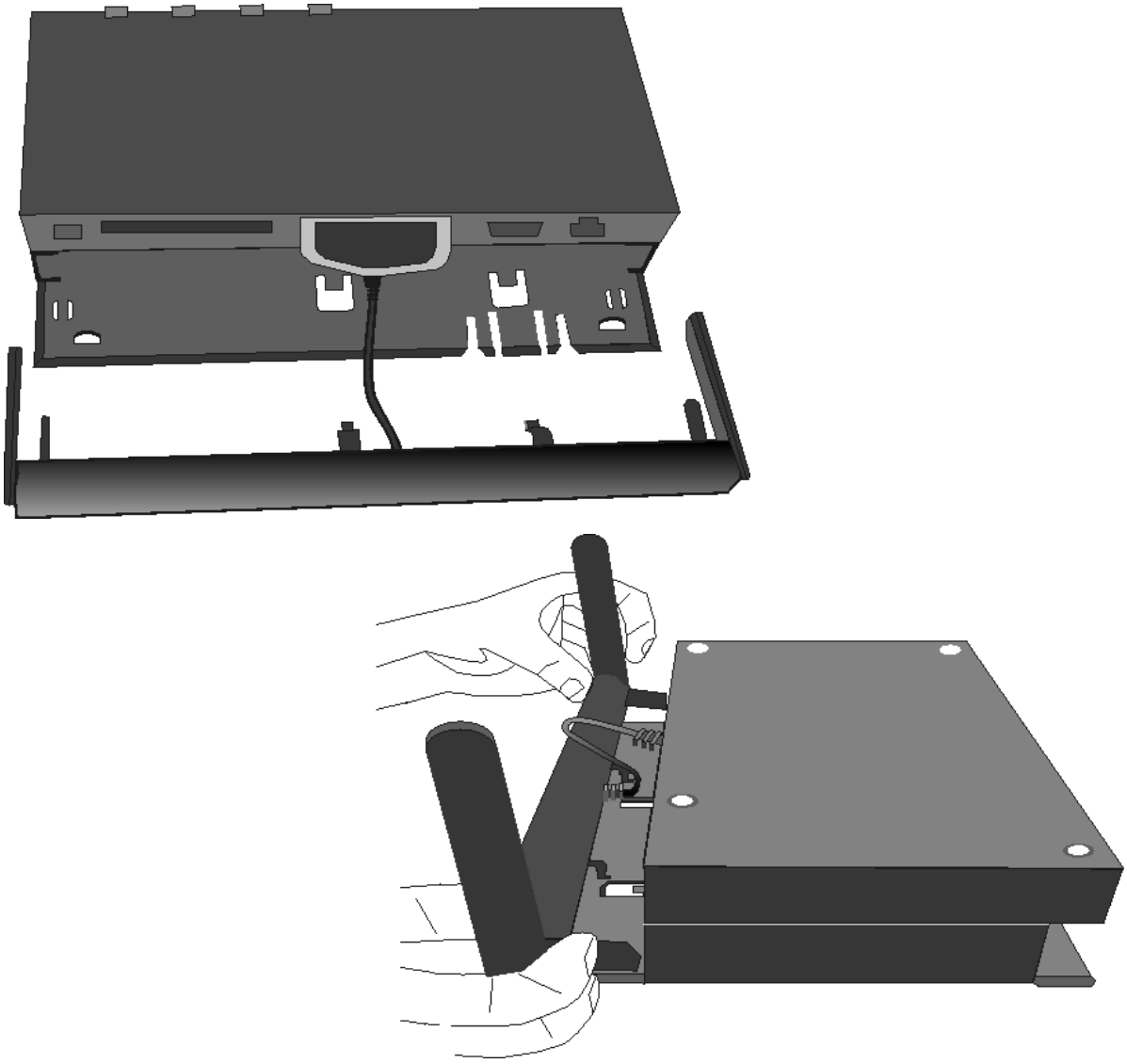
Figure 2-11. Insert Card and Antenna



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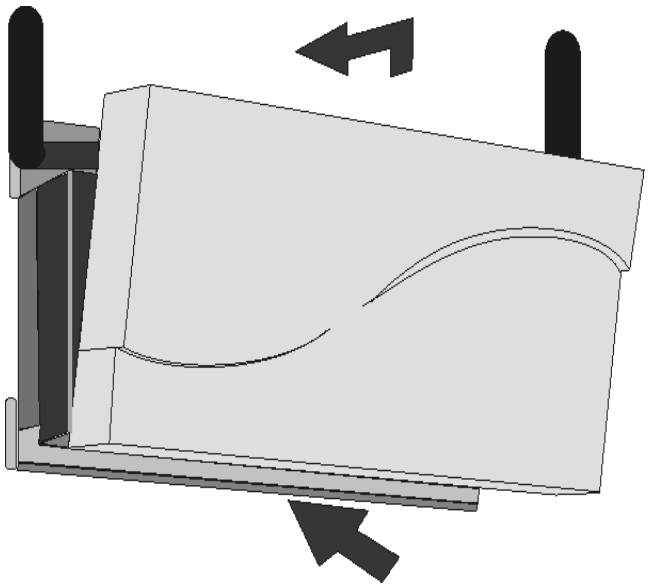
6. Angle the antenna adapter slightly upwards, pinch the end tabs inwards and carefully slide the antenna adapter onto the mounting bracket.
7. Gently push forward while rotating the antenna downwards and clip the adapter into the small cutouts on the face of the mounting bracket.
8. Position the antenna for best reception:
   — at a 90° angle for flat surface mounts
   — at a 180° angle for wall mounts
9. Re-install the cover and mount the AP back in place.

Figure 2-12. Replace cover



10. Connect the power and Ethernet cables to the AP.

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Initialization

Avaya provides two tools to simplify the initialization and configuration of an AP:

- ScanTool
- Setup Wizard

ScanTool is included on the Installation CD; the Setup Wizard launches automatically the first time you access the HTTP interface.

NOTE:
These initialization instructions describe how to configure an AP over an Ethernet connection using ScanTool and the HTTP interface. If you want to configure the unit over the serial port, see Setting IP Address using Serial Port for information on how to access the CLI over a serial connection and Command Line Interface (CLI) for a list of supported commands.

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ScanTool

ScanTool is a software utility that is included on the installation CD-ROM. The tool automatically

- detects the Access Points installed on your network, regardless of IP address,
- lets you configure each unit's IP settings, and
- allows you to download new software to an AP that does not have a valid software image installed (see Client Connection Problems).

To access the HTTP interface and configure the AP, the AP must be assigned an IP address that is valid on its Ethernet network. By default, the AP is configured to obtain an IP address automatically from a network Dynamic Host Configuration Protocol (DHCP) server during boot-up. If your network contains a DHCP server, you can run ScanTool to find out what IP address the AP has been assigned.

Default IP Address

If your network does not contain a DHCP server, the Access Point's IP address defaults to 10.0.0.1. In this case, you can use ScanTool to assign the AP a static IP address that is valid on your network.

ScanTool Instructions

Follow these steps to install ScanTool, initialize the Access Point, and perform initial configuration:

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1. Locate the unit's Ethernet MAC address and write it down for future reference. The MAC address is printed on the product label. Each unit has a unique MAC address, which is assigned at the factory.
2. Confirm that the AP is connected to the same LAN subnet as the computer that you will use to configure the AP.
3. Power up, reboot, or reset the AP.
   — **Result:** The unit requests an IP Address from the network DHCP server.
4. Insert the Installation CD into the CD-ROM drive of the computer that you will **use to configure the AP.**
   — Result: The installation program will launch automatically.
5. Follow the on-screen instructions to install the Access Point software and documentation.

NOTE:
The Avaya Wireless Installation program supports the following operating systems:

   — Windows 98SE
   — Windows 2000
   — Windows Me
   — Windows XP

6. After the software has been installed, double-click the **ScanTool** icon on the Windows desktop to launch the program (if the program is not already running).

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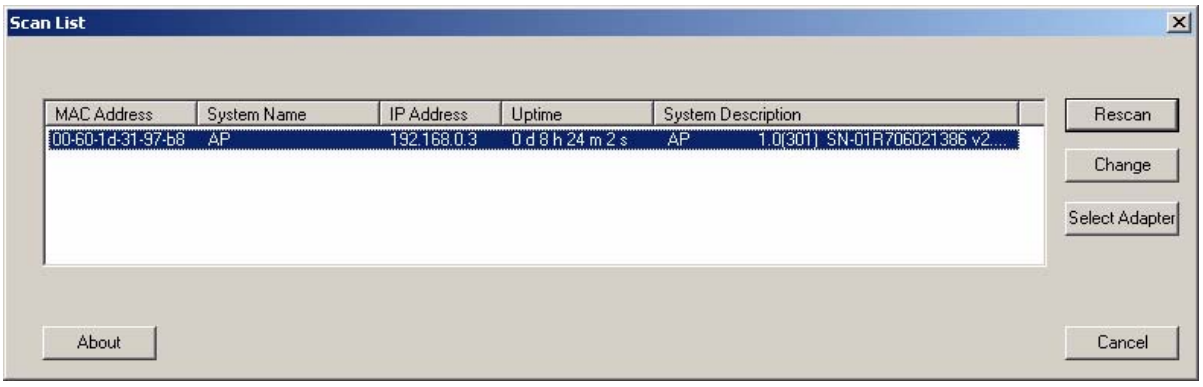
— **Result:** ScanTool scans the subnet and displays all detected Access Points. The ScanTool's ***Scan List*** screen appears, as shown in the following example.

NOTE:
If your computer has more than one network adapter installed, you will be prompted to select the adapter that you want ScanTool to use before the ***Scan List*** appears. If prompted, select an adapter and click **OK**. You can change your adapter setting at any time by clicking the **Select Adapter** button on the ***Scan List*** screen.

The ***ScanTool Network Adapter Selection*** screen will not appear if your computer only has one network adapter installed.

Figure 2-13. Scan List



7. Locate the MAC address of the AP you want to initialize within the Scan List.

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NOTE:
If your Access Point does not show up in the Scan List, click the **Rescan** button to update the display. If the unit still does not appear in the list, see Troubleshooting for suggestions. Note that after rebooting an Access Point, it may take up to five minutes for the unit to appear in the Scan List.

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8. Do one of the following:

   — If the AP has been assigned an IP address by a DHCP server on the network, write down the IP address and click **Cancel** to close ScanTool. Go to **Setup Wizard** for information on how to access the HTTP interface using this IP address.

   — If the AP has not been assigned an IP address (in other words, the unit is using its default IP address, 10.0.0.1), follow these steps to assign it a static IP address that is valid on your network:

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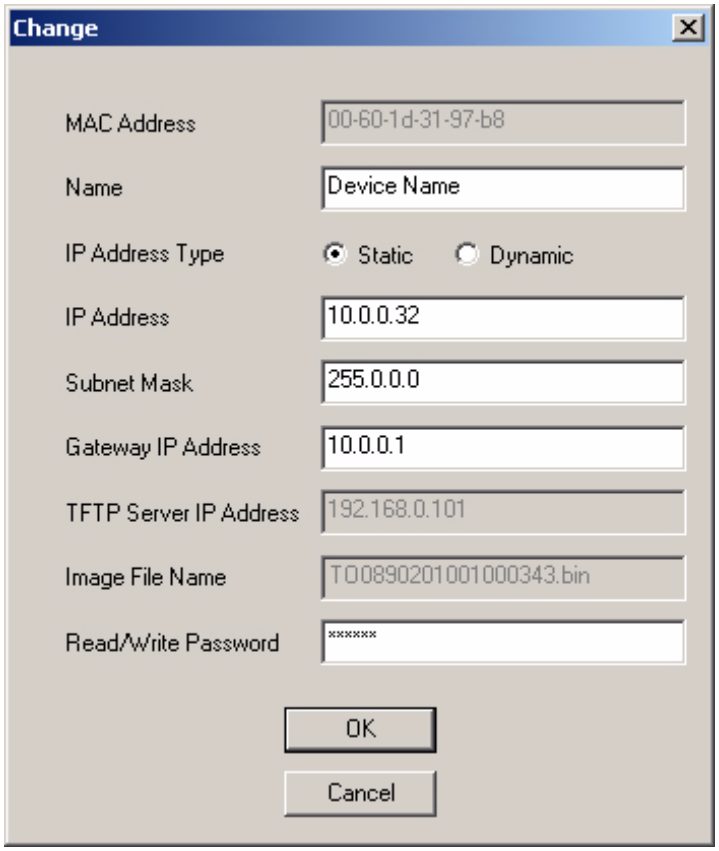
Step	Action
1.	Highlight the entry for the AP you want to configure.
2.	Click the **Change** button. **Result:** The ***Change*** screen appears. **Figure 2-14. Scan Tool Change Screen** 

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Step	Action
3.	Set **IP Address Type** to **Static**.
4.	Enter a static **IP Address** for the AP in the field provided. You must assign the unit a unique address that is valid on your IP subnet. Contact your network administrator if you need assistance selecting an IP address for the unit.
5.	Enter your network's **Subnet Mask** in the field provided.
6.	Enter your network's **Gateway IP Address** in the field provided.
7.	Enter the SNMP Read/Write password in the **Read/Write Password** field (for new units, the default SNMP Read/Write password is "public"). **NOTE:** The TFTP Server IP Address and Image File Name fields are only available if ScanTool detects that the AP does not have a valid software image installed. See Client Connection Problems.

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Step	Action
8.	Click **OK** to save your changes. **Result:** The Access Point will reboot automatically and any changes you made will take effect.
9.	When prompted, click **OK** a second time to return to the ***Scan List*** screen.
10.	Click **Cancel** to close the ScanTool.
11.	Proceed to Setup Wizard for information on how to access the HTTP interface.

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Setup Wizard

The first time you connect to an AP's HTTP interface, the Setup Wizard launches automatically. The Setup Wizard provides step-by-step instructions for how to configure the Access Point's basic operating parameter, such as Network Name, IP parameters, system parameters, and management passwords.

Setup Wizard Instructions

Follow these steps to access the Access Point's HTTP interface and launch the Setup Wizard:

1. Open a Web browser on a network computer.

   The HTTP interface supports the following Web browser:

   — Microsoft Internet Explorer 6 with Service Pack 1 or later

   — Netscape 6.1 or later

2. If necessary, disable the browser's Internet proxy settings. For Internet Explorer users, follow these steps:

   a. Select **Tools > Internet Options...**.

   b. Click the **Connections** tab.

   c. Click **LAN Settings...**.

   d. If necessary, remove the check mark from the **Use a proxy server** box.

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e. Click **OK** twice to save your changes and return to Internet Explorer.

3. Enter the Access Point's IP address in the browser's **Address** field and press **Enter**.

   This is either the

   — dynamic IP address assigned by a network DHCP server or

   — the static IP address you manually configured.

   See ScanTool for information on how to determine the unit's IP address and manually configure a new IP address, if necessary.

   — **Result:** The ***Enter Network Password*** screen appears.

4. Enter the HTTP password in the **Password** field. Leave the **User Name** field blank. For new units, the default HTTP password is "public".

   — **Result:** The Setup Wizard will launch automatically.

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Figure 2-15. Enter Network Password

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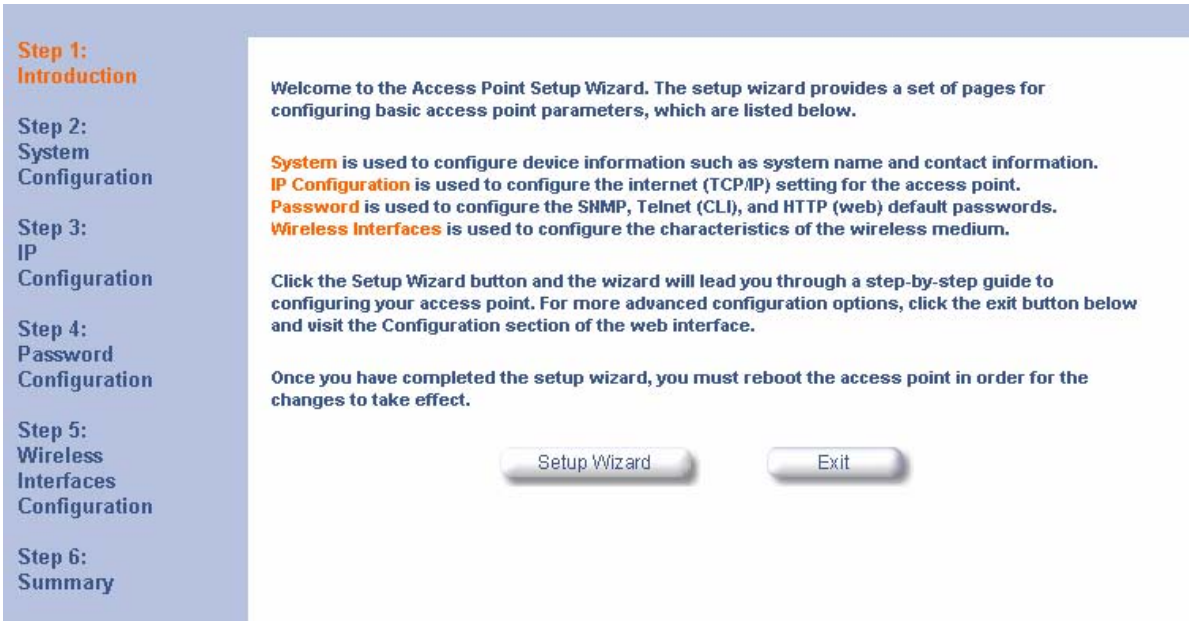
Figure 2-16. Setup Wizard


Step 1: Introduction
Step 2: System Configuration
Step 3: IP Configuration
Step 4: Password Configuration
Step 5: Wireless Interfaces Configuration
Step 6: Summary
Welcome to the Access Point Setup Wizard. The setup wizard provides a set of pages for configuring basic access point parameters, which are listed below.
System is used to configure device information such as system name and contact information.
IP Configuration is used to configure the internet (TCP/IP) setting for the access point.
Password is used to configure the SNMP, Telnet (CLI), and HTTP (web) default passwords.
Wireless Interfaces is used to configure the characteristics of the wireless medium.
Click the Setup Wizard button and the wizard will lead you through a step-by-step guide to configuring your access point. For more advanced configuration options, click the exit button below and visit the Configuration section of the web interface.
Once you have completed the setup wizard, you must reboot the access point in order for the changes to take effect.
Setup Wizard
Exit

5. Click **Setup Wizard** to begin. If you want to configure the AP without using the Setup Wizard, click **Exit** and see Advanced Configuration.

   The Setup Wizard supports the following navigation options:

   — **Save & Next Button:** Each Setup Wizard screen has a **Save & Next** button. Click this button to submit any changes you made to the unit's parameters and continue to the next page. The instructions described next shown how to navigate the Setup Wizard using the **Save & Next** buttons.

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— **Navigation Panel:** The Setup Wizard provides a navigation panel on the left-hand side of the screen. Click the link that corresponds to the parameters you want to configure to be taken to that particular configuration screen. Note that clicking a link in the navigation panel will not submit any changes you made to the unit's configuration on the current page.

— **Exit:** The navigation panel also includes an **Exit** option. Click this link to close the Setup Wizard at any time.

⚠ CAUTION:

If you exit from the Setup Wizard, any changes you submitted (by clicking the **Save & Next** button) up to that point will be saved to the unit but will not take effect until it is rebooted.

6. Configure the System Configuration settings and click **Save & Next**. See System for more information.
7. Configure the Access Point's Basic IP address settings, if necessary, and click **Save & Next**. See Basic IP Parameters for more information.
8. Assign the AP new passwords to prevent unauthorized access and click **Save & Next**. Each management interface has its own password:
   — SNMP Read Password
   — SNMP Read-Write Password
   — CLI Password
   — HTTP (Web) Password

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By default, each of these passwords is set to “public”. See Passwords for more information.

9. Configure the basic wireless interface settings and click **Save & Next**.

   — The following options are available for an **802.11a AP**:

Option	Description
Network Name (SSID)	Enter a Network Name (between 1 and 32 characters long) for the wireless network. You must configure each wireless client to use this name as well.
Auto Channel Select	By default, the AP scans the area for other Access Points and selects the best available communication channel, either a free channel (if available) or the channel with the least amount of interference. Remove the check mark to disable this option. Note that you cannot disable Auto Channel Select for 802.11a products in Europe (see Dynamic Frequency Selection (DFS) for details).

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Option	Description
Frequency Channel	When Auto Channel Select is enabled, this field is read-only and displays the Access Point's current operating channel. When Auto Channel Select is disabled, you can specify the Access Point's channel. If you decide to manually set the unit's channel, ensure that nearby devices do not use the same frequency. Available Channels vary based on regulatory domain. See 802.11a Channel Frequencies. Note that you cannot manually set the channel for 802.11a products in Europe (see Dynamic Frequency Selection (DFS) for details).
Transmit Rate	Use the drop-down menu to select a specific transmit rate for the AP. Choose between 6, 9, 12, 18, 24, 36, 48, 54 Mbits/s, and Auto Fallback. The Auto Fallback feature allows the AP to select the best transmit rate based on the cell size.

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Option	Description
WEP Encryption	Place a check mark in the box provided to enable WEP encryption. See WEP Encryption for more information.
Set Encryption Key 1	If you enabled Encryption, configure an Encryption Key. This key is used to encrypt and decrypt data between the AP and its wireless clients. Enter the number of characters that correspond to the desired key size, as described below: • Enter 10 hexadecimal characters (0-9 and A-F) or 5 ASCII characters (see ASCII Character Chart) to use 64-bit encryption. • Enter 26 hexadecimal characters or 13 ASCII characters to use 128-bit encryption. • Enter 32 hexadecimal characters or 16 ASCII characters to use 152-bit encryption.

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— The following options are available for an **802.11b AP**:

Option	Description
Network Name (SSID)	Enter a Network Name (between 1 and 32 characters long) for the wireless network. You must configure each wireless client to use this name as well.
Auto Channel Select	By default, the AP scans the area for other Access Points and selects the best available communication channel, either a free channel (if available) or the channel with the least amount of interference. Remove the check mark to disable this option. If you are setting up a Wireless Distribution System (WDS), it must be disabled. See Wireless Distribution System (WDS) for more information.

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Option	Description
Frequency Channel	When Auto Channel Select is enabled, this field is read-only and displays the Access Point's current operating channel. When Auto Channel Select is disabled, you can specify the Access Point's operating channel. If you decide to manually set the unit's channel, ensure that nearby devices do not use the same frequency (unless you are setting up a WDS). Available Channels vary based on regulatory domain. See 802.11b Channel Frequencies.
Distance Between APs	Set to **Large**, **Medium**, **Small**, **Microcell**, or **Minicell** depending on the site survey for your system. The distance value is related to the **Multicast Rate** (described next). In general, a larger distance between APs means that your clients operate a slower data rates (on average). See Distance Between APs for more information.

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<table>
<tr><th>Option</th><th>Description</th></tr>
<tr><td>Multicast Rate</td><td>Sets the rate at which Multicast messages are sent. This value is related to the Distance Between APs parameter (described previously). The table below displays the possible Multicast Rates based on the Distance between APs. See Multicast Rate for more information.

<table>
<tr><th>Distance between APs</th><th>Multicast Rate</th></tr>
<tr><td>Large</td><td>1 and 2 Mbits/sec</td></tr>
<tr><td>Medium</td><td>1, 2, and 5.5 Mbits/sec</td></tr>
<tr><td>Small</td><td>1, 2, 5.5 and 11 Mbits/sec</td></tr>
<tr><td>Minicell</td><td>1, 2, 5.5 and 11 Mbits/sec</td></tr>
<tr><td>Microcell</td><td>1, 2, 5.5 and 11 Mbits/sec</td></tr>
</table>
</td></tr>
</table>

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Option	Description
WEP Encryption	Place a check mark in the box provided to enable WEP encryption. See WEP Encryption for more information.
Set Encryption Key 1	If you enabled Encryption, configure an Encryption Key. This key is used to encrypt and decrypt data between the AP and its wireless clients. Enter the number of characters that correspond to the desired key size, as described below: • Enter 10 hexadecimal characters (0-9 and A-F) or 5 ASCII characters (see ASCII Character Chart) to use 64-bit encryption. • Enter 26 hexadecimal characters (0-9 and A-F) or 13 ASCII characters to use 128-bit encryption

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— The following options are available for an **802.11b/g AP**:

Option	Description
Operational Mode	An 802.11b/g wireless interface can be configured to operate in the following modes: • 802.11b mode only • 802.11g mode only • 802.11g-wifi mode • 802.11bg mode (default)
Network Name (SSID)	Enter a Network Name (between 1 and 32 characters long) for the wireless network. You must configure each wireless client to use this name as well.
Auto Channel Select	By default, the AP scans the area for other Access Points and selects the best available communication channel, either a free channel (if available) or the channel with the least amount of interference. Remove the check mark to disable this option.

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Option	Description
Frequency Channel	When Auto Channel Select is enabled, this field is read-only and displays the Access Point's current operating channel. When Auto Channel Select is disabled, you can specify the Access Point's channel. If you decide to manually set the unit's channel, ensure that nearby devices do not use the same frequency. Available Channels vary based on regulatory domain. See 802.11g Channel Frequencies.
Transmit Rate	Select a specific transmit rate for the AP. The values available depend on the Operational Mode. Auto Fallback is the default setting; it allows the AP to select the best transmit rate based on the cell size. • For 802.11b only -- Auto Fallback, 1, 2, 5.5, 11 Mbits/sec • For 802.11g only -- Auto Fallback, 6, 9, 12, 18, 24, 36, 48, 54 Mbits/sec • For 802.11bg and 802.11g-wifi-- Auto Fallback, 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, 54 Mbits/sec

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Option	Description
WEP Encryption	Place a check mark in the box provided to enable WEP encryption. See WEP Encryption for more information.

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Option	Description
Set Encryption Key 1	If you enabled Encryption, configure an Encryption Key. This key is used to encrypt and decrypt data between the AP and its wireless clients. Enter the number of characters that correspond to the desired key size, as described below: • Enter 10 hexadecimal characters (0-9 and A-F) or 5 ASCII characters (see ASCII Character Chart) to use 64-bit encryption. • Enter 26 hexadecimal characters or 13 ASCII characters to use 128-bit encryption. • Enter 32 hexadecimal characters or 16 ASCII characters to use 152-bit encryption.

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Option	Description
Set Encryption Key 1 (continued)	**NOTE:** Additional advanced settings are available in the ***Wireless Interface Configuration*** screen. See Wireless (802.11a), Wireless (802.11b), or Wireless (802.11b/g) for details. See Security for more information on security features.

10. Review the configuration summary. If you want to make any additional changes, use the navigation panel on the left-hand side of the screen to return to an earlier screen. After making a change, click **Save & Next** to save the change and proceed to the next screen.
11. When finished, click **Reboot** on the Summary screen to restart the AP and apply your changes.

Download the Latest Software

Avaya periodically releases updated software for the AP on its Web site at http://www.avaya.com/support. Avaya recommends that you check the Web site for the latest updates after you have installed and initialized the unit.

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Three types of files can be downloaded to the AP from a TFTP server:

- img (AP software image or kernel)
- config (configuration file)
- bspBl (BSP/Bootloader firmware file)

Setup your TFTP Server

A Trivial File Transfer Protocol (TFTP) server allows you to transfer files across a network. You can

- upload files from the AP for backup or copying, and
- download the files for configuration and AP Image upgrades.

The Solarwinds TFTP server software is located on the Avaya Wireless AP Installation CD-ROM. You can also download the latest TFTP software from Solarwind's Web site at http://www.solarwinds.net.

If a TFTP server is not configured and running, you will not be able to download and upload images and configuration files to/from the AP. Remember that the TFTP server does not have to be local as long as you have a valid TFTP IP address. Also, a TFTP server does not have to be running for the AP to perform tasks that do not involve file transfers.

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After the TFTP server is installed:

- Check to see that TFTP is configured to point to the directory containing the AP Image.
- Make sure you have the proper TFTP server IP address, the proper AP Image file name, and that the TFTP server is operational.
- **Make sure the TFTP server is configured to both Transmit and Receive files, with no automatic shutdown or time-out.**

Download Updates from your TFTP Server using the Web Interface

1. Download the latest software from http://www.avaya.com/support.
2. Copy the latest software updates to your TFTP server.
3. In the Web Interface, click the **Commands** button and select the **Download** tab.
4. Enter the IP address of your TFTP server in the field provided.
5. Enter the **File Name** (including the file extension). Enter the full directory path and file name. If the file is located in the default TFTP directory, you need enter only the file name.
6. Select the **File Type** from the drop-down menu (use *Img* for software updates).
7. Select **Download & Reboot** from the **File Operation** drop-down menu.
8. Click **OK**.

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9. The Access Point will reboot automatically when the download is complete.

Download Updates from your TFTP Server using the CLI Interface

1. Download the latest software from http://www.avaya.com/support.
2. Copy the latest software updates to your TFTP server.
3. Open the CLI interface via Telnet or a serial connection.
4. Enter the CLI password when prompted.
5. Type **set tftpfilename <file name>** (include the file extension) and press **Enter**.
6. Type **set tftpfiletype img** and press **Enter**.
7. Type **set tftpipaddr <IP address of your TFTP server>** and press **Enter**.
8. Type **show tftp** and confirm that the file name, file type, and IP address are correct.
9. Type **download *** and press **Enter**.
   — **Result:** The download will begin. Be patient while the image is downloaded to the Access Point.
10. When the download is complete, type **reboot 0** and press **Enter**.

NOTE:
See Command Line Interface (CLI) for more information.

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Additional Hardware Features

- Installing the AP in a Plenum
- Active Ethernet
- LED Indicators

Installing the AP in a Plenum

In an office building, plenum is the space between the structural ceiling and the tile ceiling that is provided to help air circulate. Many companies also use the plenum to house communication equipment and cables. However, these products and cables must comply with certain safety requirements, such as Underwriter Labs (UL) Standard 2043: “Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces”.

The AP has been certified under UL Standard 2043 and can be installed in the plenum only when the following conditions apply:

- The unit's plastic cover has been removed.
- The power supply of the Access Point has been removed.
- There are two 802.11b cards in the cards slots.
  OR
- There is one 802.11b card and the other card slot is protected with the metal faceplate provided in your kit.

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NOTE:
The 5GHz Antenna Adapter Kit or 11a Upgrade Kit is not approved in accordance with UL-2043 for use in a plenum. The Access Point using a power supply, should not be plenum mounted. Use Active Ethernet to power the units mounted in a plenum environment.

Installing/Removing the Metal Faceplate

1. When using only one card in the Access Point mounted in a plenum environment, remove the plastic cover.
2. Place the top edge of the faceplate under the front ridge of the metal enclosure.
3. Snap the faceplate in the empty card slot in the Access Point.

CAUTION:
Do not drop the faceplate into the card slot in the AP.

4. To install a second radio card, the faceplate must be removed. Gently pry the faceplate off using the tab on the faceplate.

Active Ethernet

An Active Ethernet-enabled AP is equipped with an 802.3af-compliant Active Ethernet module. Active Ethernet (AE) delivers both data and power to the access point over a single Ethernet cable. If you choose to use Active Ethernet, there is no difference in operation; the only difference is in the power source.

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- The Active Ethernet (AE) integrated module receives ~48 VDC over a standard Category 5 Ethernet cable.
- To use Active Ethernet, you must have an AE hub (also known as a power injector) connected to the network.
- The cable length between the AE hub and the Access Point should not exceed 100 meters (approximately 325 feet).
- The AE hub is not a repeater and does not amplify the Ethernet data signal.
- If connected to an AE hub and an AC power simultaneously, the Access Point draws power from Active Ethernet.
- Maximum power supplied to an Access Point is 11 Watts; the unit typically draws approximately 10 Watts.

Also see Hardware Specifications.

NOTE:
The AP's 802.3af-compliant Active Ethernet module is backwards compatible with all Avaya Wireless Active Ethernet hubs that do not support the IEEE 802.3af standard.

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LED Indicators

The AP-3 has four LED indicators, which exhibit the following behavior:

Power	Ethernet	PC Card A	PC Card B	Indication
Green	Green flash with data activity	Green flash with data activity	Green flash with data activity	Normal Operation
Amber	Red	Amber	Amber	Rebooting/Power On Self Test (POST)
Amber	n/a (not applicable)	n/a	n/a	Missing or bad AP image if amber after reboot.
Red	Red	n/a	n/a	Power On Self Test (POST) running
n/a	n/a	Red	Red	PC Card incompatible on indicated interface.
n/a	n/a	Red	Red	PC Card failure on indicataed interface.
Green	n/a	Amber	Amber	Indicated interface in Administrative State
n/a	n/a	Off	Off	PC Card not present

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Related Topics

The Setup Wizard helps you configure the basic AP settings required to get the unit up and running. The AP supports many other configuration and management options. The remainder of this user guide describes these options in detail.

- See Advanced Configuration for information on configuration options that are available within the Access Point's HTTP interface.
- See Monitor Information for information on the statistics displayed within the Access Point's HTTP interface.
- See Commands for information on the commands supported by the Access Point's HTTP interface.
- See Troubleshooting for troubleshooting suggestions.
- See Command Line Interface (CLI) for information on the CLI interface and for a list of CLI commands.

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Status Information 3

In This Chapter

- Logging into the HTTP Interface
- System Status

Logging into the HTTP Interface

Once the AP has a valid IP Address and an Ethernet connection, you may use your web browser to monitor the system status.

Follow these steps to monitor an AP's operating statistics using the HTTP interface:

1. Open a Web browser on a network computer.

NOTE:
The HTTP interface supports the following Web browser:

— Microsoft Internet Explorer 6 with Service Pack 1 or later

— Netscape 6.1 or later

2. If necessary, disable the Internet proxy settings. For Internet Explorer users, follow these steps:

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— Select **Tools > Internet Options...**.

— Click the **Connections** tab.

— Click **LAN Settings...**.

— If necessary, remove the check mark from the **Use a proxy server** box.

— Click **OK** twice to save your changes and return to Internet Explorer.

3. Enter the Access Point's IP address in the browser's **Address** field and press **Enter**.

   — **Result:** The ***Enter Network Password*** screen appears.

4. Enter the HTTP password in the **Password** field and click **OK**. Leave the **User Name** field blank. (By default, the HTTP password is "public").

   — **Result:** The ***System Status*** screen appears.

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Figure 3-1. Enter Network Password Screen

System Status

System Status is the first screen to appear each time you connect to the HTTP interface. You can also return to this screen by clicking the **Status** button.

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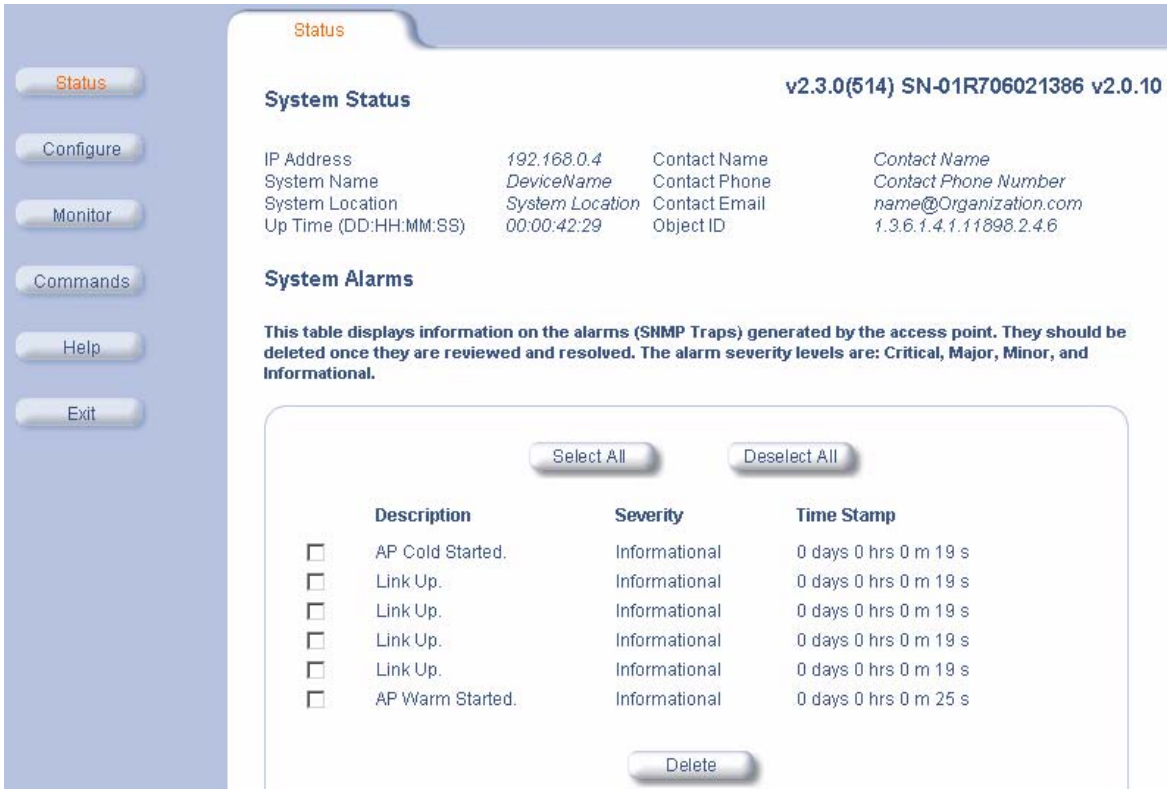
Figure 3-2. System Status Screen


Status
Status
Configure
Monitor
Commands
Help
Exit
System Status
v2.3.0(514) SN-01R706021386 v2.0.10
IP Address 192.168.0.4
System Name DeviceName
System Location System Location
Up Time (DD:HH:MM:SS) 00:00:42:29
Contact Name Contact Name
Contact Phone Contact Phone Number
Contact Email name@Organization.com
Object ID 1.3.6.1.4.1.11898.2.4.6
System Alarms
This table displays information on the alarms (SNMP Traps) generated by the access point. They should be deleted once they are reviewed and resolved. The alarm severity levels are: Critical, Major, Minor, and Informational.
Select All
Deselect All
Description
Severity
Time Stamp
AP Cold Started. Informational 0 days 0 hrs 0 m 19 s
Link Up. Informational 0 days 0 hrs 0 m 19 s
Link Up. Informational 0 days 0 hrs 0 m 19 s
Link Up. Informational 0 days 0 hrs 0 m 19 s
Link Up. Informational 0 days 0 hrs 0 m 19 s
AP Warm Started. Informational 0 days 0 hrs 0 m 25 s
Delete

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Each section of the ***System Status*** screen provides the following information:

— **System Status:** This area provides system level information, including the unit's IP address and contact information. See System for information on these settings.

— **System Alarms:** System traps (if any) appear in this area. Each trap identifies a specific severity level: Critical, Major, Minor, and Informational. See Alarms for a list of possible alarms.

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Advanced Configuration 4

In This Chapter

- Configuring the AP Using the HTTP Interface
- System: Configure specific system information such as system name and contact information.
- Network: Configure IP settings, DNS client, DHCP server, and Link Integrity.
- Interfaces: Configure the Access Point's interfaces: Wireless and Ethernet.
- Management: Configure the Access Point's management Passwords, IP Access Table, and Services.
- Filtering: Configure Ethernet Protocol filters, Static MAC Address filters, Advanced filters, and Port filters.
- Alarms: Configure the Alarm (SNMP Trap) Groups, the Alarm Host Table, and the Syslog features.
- Bridge: Configure the Spanning Tree Protocol, Storm Threshold protection, Intra BSS traffic, and Packet Forwarding.
- Security: Configure security features such as MAC Access Control, WPA, WEP Encryption, and 802.1x.

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- RADIUS: Configure RADIUS features such as RADIUS Access Control and Accounting.
- VLAN/SSID: Configure VLAN IDs and SSIDs.

Configuring the AP Using the HTTP Interface

Follow these steps to configure an Access Point's operating settings using the HTTP interface:

1. Open a Web browser on a network computer.

NOTE:
The HTTP interface supports the following Web browser:

— Microsoft Internet Explorer 6 with Service Pack 1 or later

— Netscape 6.1 or later

2. If necessary, disable the Internet proxy settings. For Internet Explorer users, follow these steps:

— Select **Tools > Internet Options...**.

— Click the **Connections** tab.

— Click **LAN Settings...**.

— If necessary, remove the check mark from the **Use a proxy server** box.

— Click **OK** twice to save your changes and return to Internet Explorer.

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3. Enter the Access Point's IP address in the browser's **Address** field and press **Enter**.

   — **Result:** The ***Enter Network Password*** screen appears.

4. Enter the HTTP password in the **Password** field and click **OK**. Leave the **User Name** field blank. (By default, the HTTP password is "public").

   — Result: The ***System Status*** screen appears.

Figure 4-1. Enter Network Password Screen

5. Click the **Configure** button located on the left-hand side of the screen.

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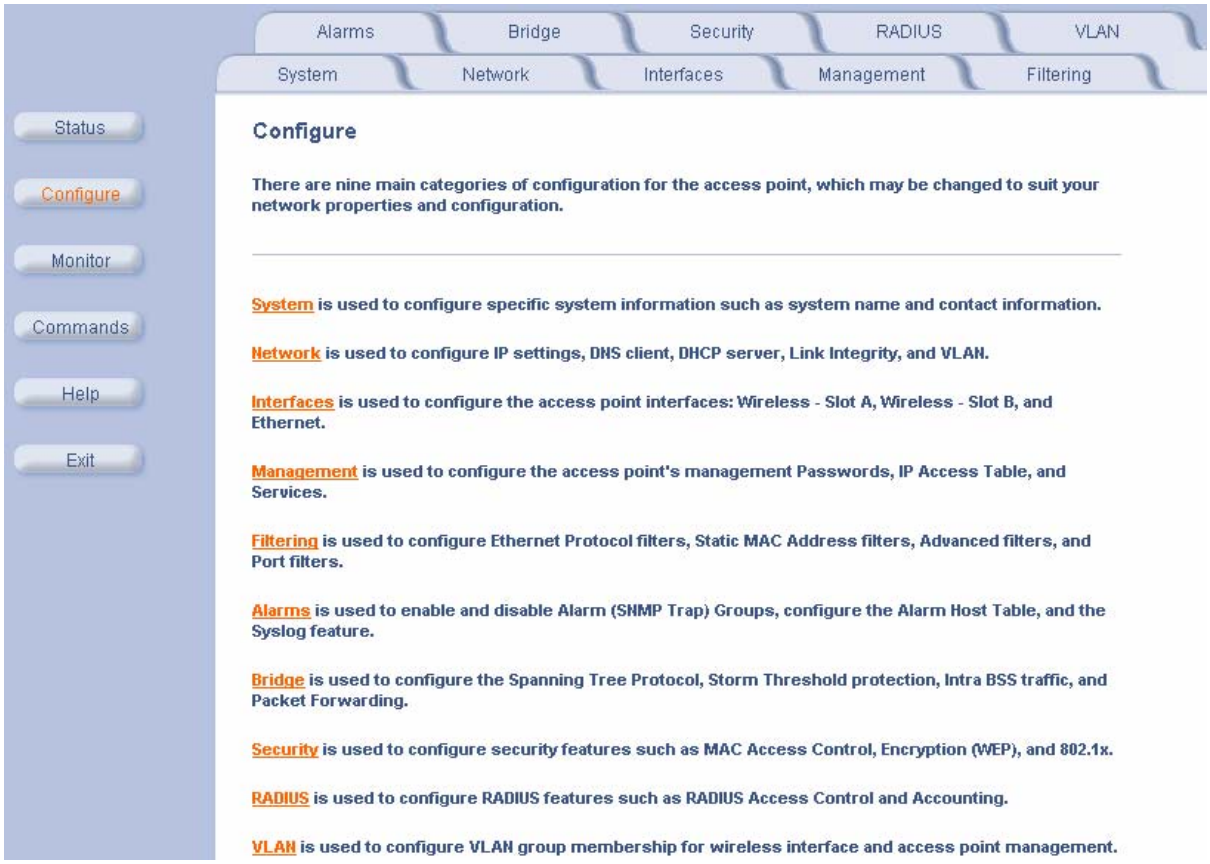
Figure 4-2. Configure Main Screen


Alarms
Bridge
Security
RADIUS
VLAN
System
Network
Interfaces
Management
Filtering
Status
Configure
Monitor
Commands
Help
Exit
Configure
There are nine main categories of configuration for the access point, which may be changed to suit your network properties and configuration.
System is used to configure specific system information such as system name and contact information.
Network is used to configure IP settings, DNS client, DHCP server, Link Integrity, and VLAN.
Interfaces is used to configure the access point interfaces: Wireless - Slot A, Wireless - Slot B, and Ethernet.
Management is used to configure the access point's management Passwords, IP Access Table, and Services.
Filtering is used to configure Ethernet Protocol filters, Static MAC Address filters, Advanced filters, and Port filters.
Alarms is used to enable and disable Alarm (SNMP Trap) Groups, configure the Alarm Host Table, and the Syslog feature.
Bridge is used to configure the Spanning Tree Protocol, Storm Threshold protection, Intra BSS traffic, and Packet Forwarding.
Security is used to configure security features such as MAC Access Control, Encryption (WEP), and 802.1x.
RADIUS is used to configure RADIUS features such as RADIUS Access Control and Accounting.
VLAN is used to configure VLAN group membership for wireless interface and access point management.

6. Click the tab that corresponds to the parameter you want to configure. For example, click **Network** to configure the Access Point's TCP/IP settings. The parameters contained in each of the nine configuration categories are described later in this chapter.

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7. Configure the Access Point's parameters as necessary. After changing a configuration value, click **OK** to save the change.
8. Reboot the Access Point for all of the changes to take effect.

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System

You can configure and view the following parameters within the ***System Configuration*** screen:

Parameters	Description
Name	The name assigned to the AP.
Location	The location where the AP is installed.
Contact Name	The name of the person responsible for the AP.
Contact Email	The email address of the person responsible for the AP.
Contact Phone	The telephone number of the person responsible for the AP.
Object ID	This is a read-only field that displays the Access Point's MIB definition; this information is useful if you are managing the AP using SNMP.
Ethernet MAC Address	This is a read-only field that displays the unique MAC (Media Access Control) address for the Access Point's Ethernet interface. The MAC address is assigned at the factory.

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Parameters	Description
Descriptor	This is a read-only field that reports the Access Point's name, serial number, current image software version, and current bootloader software version.
Up Time	This is a read-only field that displays how long the Access Point has been running since its last reboot.

Network

The Network category contains three sub-categories.

- IP Configuration
- DHCP Server
- Link Integrity

IP Configuration

You can configure and view the following parameters within the ***IP Configuration*** screen:

NOTE:
You must reboot the Access Point in order for any changes to the Basic IP or DNS Client parameters take effect.

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Basic IP Parameters

Parameter	Description
IP Address Assignment Type	Set this parameter to **Dynamic** to configure the Access Point as a Dynamic Host Configuration Protocol (DHCP) client; the Access Point will obtain IP settings from a network DHCP server automatically during boot-up. If you do not have a DHCP server or if you want to manually configure the Access Point's IP settings, set this parameter to **Static**.
IP Address	The Access Point's IP address. When IP Address Assignment Type is set to Dynamic, this field is read-only and reports the unit's current IP address. The Access Point will default to 10.0.0.1 if it cannot obtain an address from a DHCP server.

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Parameter	Description
Subnet Mask	The Access Point's subnet mask. When IP Address Assignment Type is set to Dynamic, this field is read-only and reports the unit's current subnet mask. The subnet mask will default to 255.0.0.0 if the unit cannot obtain one from a DHCP server.
Gateway IP Address	The IP address of the Access Point's gateway. When IP Address Assignment Type is set to Dynamic, this field is read-only and reports the IP address of the unit's gateway. The gateway IP address will default to 10.0.0.2 if the unit cannot obtain an address from a DHCP server.

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DNS Client

If you prefer to use host names to identify network servers rather than IP addresses, you can configure the AP to act as a Domain Name Service (DNS) client. When this feature is enabled, the Access Point contacts the network's DNS server to translate a host name to the appropriate network IP address. You can use this DNS Client functionality to identify RADIUS servers by host name. See RADIUS for details.

Parameter	Description
Enable DNS Client	Place a check mark in the box provided to enable DNS client functionality. Note that this option must be enabled before you can configure the other DNS Client parameters.
DNS Primary Server IP Address	The IP address of the network's primary DNS server.

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Parameter	Description
DNS Secondary Server IP Address	The IP address of a second DNS server on the network. The Access Point will attempt to contact the secondary server if the primary server is unavailable.
DNS Client Default Domain Name	The default domain name for the Access Point's network (for example, "avaya.com"). Contact your network administrator if you need assistance setting this parameter.

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Advanced

Default TTL (Time to Live): Time to Live (TTL) is a field in an IP packet that specifies how long in seconds the packet can remain active on the network. The Access Point uses the default TTL for packets it generates for which the transport layer protocol does not specify a TTL value. This parameter supports a range from 0 to 65535. By default, TTL is 64.

DHCP Server

If your network does not have a DHCP Server, you can configure the AP as a DHCP server to assign dynamic IP addresses to Ethernet nodes and wireless clients.

⚠ CAUTION:
Make sure there are no other DHCP servers on the network and do not enable the DHCP server without checking with your network administrator first, as it could bring down the whole network. Also, the AP must be configured with a static IP address before enabling this feature.

When the DHCP Server functionality is enabled, you can create one or more IP address pools from which to assign addresses to network devices.

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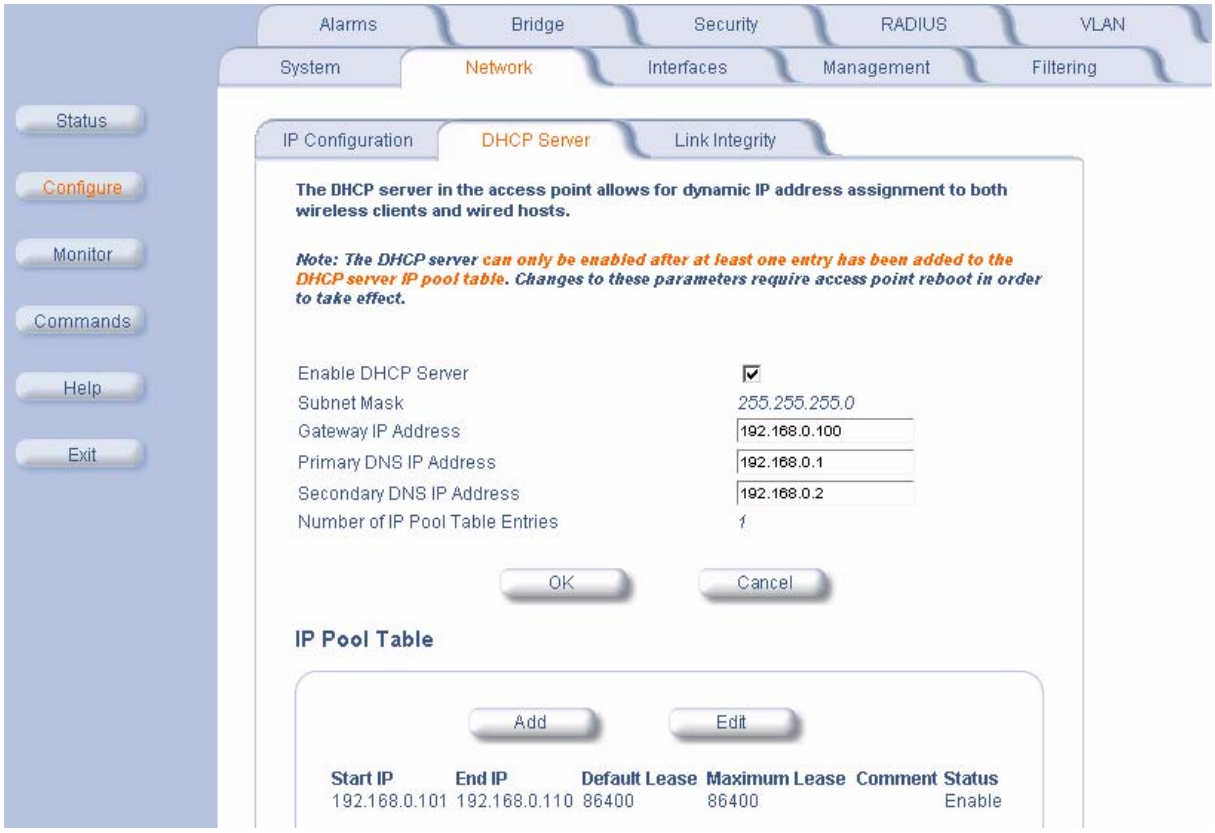
Figure 4-3. DHCP Server Configuration Screen



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You can configure and view the following parameters within the ***DHCP Server Configuration*** screen:

Parameter	Description
Enable DHCP Server	Place a check mark in the box provided to enable DHCP Server functionality. **NOTE:** You cannot enable the DHCP Server functionality unless there is at least one IP Pool Table Entry configured.
Subnet Mask	This field is read-only and reports the Access Point's current subnet mask. DHCP clients that receive dynamic addresses from the AP will be assigned this same subnet mask.
Gateway IP Address	The AP will assign the specified address to its DHCP clients.
Primary DNS IP Address	The AP will assign the specified address to its DHCP clients.
Secondary DNS IP Address	The AP will assign the specified address to its DHCP clients.
Number of IP Pool Table Entries	This is a read-only field that reports the number of IP address pools currently configured.

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Parameter	Description
IP Pool Table Entry	This entry specifies a range of IP addresses that the AP can assign to its wireless clients. Click **Add** to create a new entry. Click **Edit** to change an existing entry. Each entry contains the following field: • **Start IP Address** • **End IP Address** • **Default Lease Time (optional):** The default time value for clients to retain the assigned IP address. DHCP automatically renews IP Addresses without client notification. This parameter supports a range between 0 and 86400 seconds. The default is 86400 seconds. • **Maximum Lease Time (optional):** The maximum time value for clients to retain the assigned IP address. DHCP automatically renews IP Addresses without client notification. This parameter supports a range between 0 and 86400 seconds. The default is 86400 seconds. • **Comment (optional)**

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Parameter	Description
IP Pool Table Entry (continued)	**Status:** IP Pools are enabled upon entry in the table. You can also disable or delete entries by changing this field's value. **NOTE:** You must reboot the Access Point before changes to any of these DHCP server parameters take effect

Link Integrity

The Link Integrity feature checks the link between the AP and the nodes on the Ethernet backbone. These nodes are listed by IP address in the Link Integrity IP Address Table. The AP periodically pings the nodes listed within the table. If the AP loses network connectivity (that is, the ping attempts fail), the AP disables its wireless interface until the connection is restored. This forces the unit's wireless clients to switch to another Access Point that still has a network connection. Note that this feature does not affect WDS links (if applicable).

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You can configure and view the following parameters within the ***Link Integrity Configuration*** screen:

Parameter	Description
Enable Link Integrity	Place a check mark in the box provided to enable Link Integrity.
Poll Interval (milliseconds)	The interval between link integrity checks. Range is 500 - 15000 ms in increments of 500 ms; default is 500 ms.
Poll Retransmissions	The number of times a poll should be retransmitted before the link is considered down. Range is 0 to 255; default is 5.
Target IP Address Entry	This entry specifies the IP address of a host on the network that the AP will periodically poll to confirm connectivity. The table can hold up to five entries. By default, all five entries are set to 0.0.0.0. Click **Edit** to update one or more entries. Each entry contains the following field: • **Target IP Address** • **Comment** (optional) • **Status:** Set this field to **Enable** to specify that the Access Point should poll this device. You can also disable an entry by changing this field's value to **Disable**.

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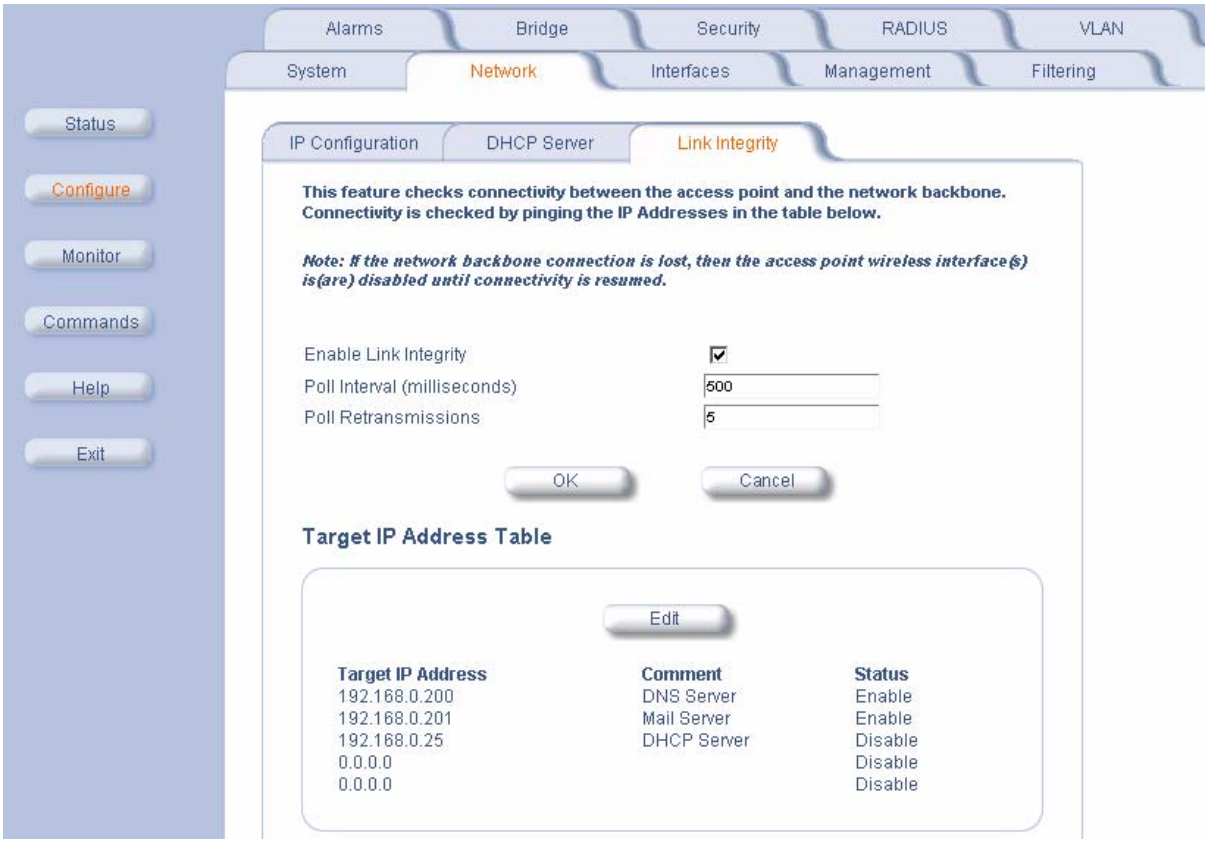
Figure 4-4. Link Integrity Configuration Screen



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Interfaces

From the **Interfaces** tab, you configure the Access Point's radio and Ethernet settings. Refer to the Wireless parameters below that correspond to your radio type.

- Wireless (802.11a)
- Wireless (802.11b)
- Wireless (802.11b/g)
- Ethernet

Wireless (802.11a)

You can configure and view the following parameters within the ***Wireless Interface Configuration*** screen for an 802.11a AP:

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NOTE:
You must reboot the Access Point before any changes to these parameters take effect.

Parameter	Description
Physical Interface Type	For an 802.11a AP, this field reports: “802.11a (OFDM 5 GHz).” OFDM stands for Orthogonal Frequency Division Multiplexing; this is the name for the radio technology used by 802.11a devices.
MAC Address	This is a read-only field that displays the unique MAC (Media Access Control) address for the Access Point’s wireless interface. The MAC address is assigned at the factory.

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Parameter	Description
Regulatory Domain	Reports the regulatory domain for which the AP is certified. Not all features or channels are available in all countries. The available regulatory domains include: • FCC - U.S./Canada, Mexico, and Australia • ETSI - Europe and the United Kingdom • MKK: Japan • SG: Singapore • ASIA: China, Hong Kong, and South Korea • TW: Taiwan
Network Name (SSID)	Enter a Network Name (between 1 and 32 characters long) for the wireless network. You must configure each wireless client to use this name as well.

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Parameter	Description
Auto Channel Select	The AP scans the area for other Access Points and selects a free or relatively unused communication channel. This helps prevent interference problems and increases network performance. By default this feature is enabled. Note that you cannot disable Auto Channel Select for 802.11a products in Europe (see Dynamic Frequency Selection (DFS) for details). See 802.11a Channel Frequencies for a list of Channels.
Frequency Channel	When Auto Channel Select is enabled, this field is read-only and displays the Access Point's current operating Channel. When Auto Channel Select is disabled, you can specify the Access Point's channel. If you decide to manually set the unit's Channel, ensure that nearby devices do not use the same frequency. Available Channels vary based on regulatory domain. See 802.11a Channel Frequencies. Note that you cannot manually set the channel for 802.11a products in Europe (see Dynamic Frequency Selection (DFS) for details).

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Parameter	Description
Transmit Rate	Use the drop-down menu to select a specific transmit rate for the AP. Choose between 6, 9, 12, 18, 24, 36, 48, 54 Mbits/s, and Auto Fallback. Auto Fallback is the default setting; it allows the AP unit to select the best transmit rate based on the cell size.
DTIM Period	The Deferred Traffic Indicator Map (DTIM) is used with clients that have power management enabled. DTIM should be left at 1, the default value, if any clients have power management enabled. This parameter supports a range between 1 and 255.

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Parameter	Description
RTS/CTS Medium Reservation	This parameter affects message flow control and should not be changed under normal circumstances. Range is 0 to 2347. When set to a value between 0 and 2347, the Access Point uses the RTS/CTS mechanism for packets that are the specified size or greater. When set to 2347 (the default setting), RTS/CTS is disabled. See RTS/CTS Medium Reservation for more information.
Closed System	Check this box to allow only clients configured with the Access Point's specific Network Name to associate with the Access Point. When enabled, a client configured with the Network Name "ANY" cannot connect to the AP. This option is disabled by default.

Dynamic Frequency Selection (DFS)

802.11a APs sold in Europe use a technique called Dynamic Frequency Selection (DFS) to automatically select an operating channel. During boot-up, the AP scans the available frequency and selects a channel that is free of interference. If the AP subsequently detects interference on its channel, it automatically reboots and selects another channel that is free of interference.

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DFS only applies to 802.11a APs used in Europe (i.e., units whose regulatory domain is set to ETSI). The European Telecommunications Standard Institute (ETSI) requires that 802.11a devices use DFS to prevent interference with radar systems and other devices that already occupy the 5 GHz band.

If you are using an 802.11a AP in Europe, keep in mind the following:

- DFS is not a configurable parameter. It is always enabled and cannot be disabled.
- You cannot manually select the device's operating channel; you must let DFS select the channel.
- You cannot configure the **Auto Channel Select** option. Within the HTTP interface, this option always appears enabled.

RTS/CTS Medium Reservation

The 802.11 standard supports optional RTS/CTS communication based on packet size. Without RTS/CTS, a sending radio listens to see if another radio is already using the medium before transmitting a data packet. If the medium is free, the sending radio transmits its packet. However, there is no guarantee that another radio is not transmitting a packet at the same time, causing a collision. This typically occurs when there are hidden nodes (clients that can communicate with the Access Point but are out of range of each other) in very large cells.

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When RTS/CTS occurs, the following occurs.

1. The sending radio first transmits a Request to Send (RTS) packet to confirm that the medium is clear.
2. When the receiving radio successfully receives the RTS packet, it transmits back a Clear to Send (CTS) packet to the sending radio.
3. When the sending radio receives the CTS packet, it sends the data packet to the receiving radio. The RTS and CTS packets contain a reservation time to notify other radios (including hidden nodes) that the medium is in use for a specified period. This helps to minimize collisions.

While RTS/CTS adds overhead to the radio network, it is particularly useful for large packets that take longer to resend after a collision occurs.

RTS/CTS Medium Reservation is an advanced parameter and supports a range between 0 and 2347 bytes. When set to 2347 (the default setting), the RTS/CTS mechanism is disabled. When set to 0, the RTS/CTS mechanism is used for all packets. When set to a value between 0 and 2347, the Access Point uses the RTS/CTS mechanism for packets that are the specified size or greater. You should not need to enable this parameter for most networks unless you suspect that the wireless cell contains hidden nodes.

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Wireless (802.11b)

You can configure and view the following parameters within the ***Wireless Interface Configuration*** screen for an 802.11b AP:

NOTE:
You must reboot the Access Point before any changes to these parameters take effect.

Parameter	Description
Physical Interface Type	For 802.11b AP, this field reports: “802.11b (DSSS 2.4 GHz).” DSSS stands for Direct Sequence Spread Spectrum; this is the name for the radio technology used by 802.11b devices.
MAC Address	This is a read-only field that displays the unique MAC (Media Access Control) address for the Access Point’s wireless interface. The MAC address is assigned at the factory.

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Parameter	Description
Regulatory Domain	Reports the regulatory domain for which the AP is certified. Not all features or channels are available in all countries. The available regulatory domains include: • FCC - U.S./Canada, Mexico, and Australia • ETSI - Most of Europe, including the United Kingdom, Ireland, Singapore, and Hong Kong • MKK: Japan • IL - Israel
Network Name (SSID)	Enter a Network Name (between 1 and 32 characters long) for the wireless network. You must configure each wireless client to use this name as well.

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Parameter	Description
Auto Channel Select	The AP scans the area for other Access Points and selects a free or relatively unused communication channel. This helps prevent interference problems and increases network performance. By default this feature is enabled; see 802.11b Channel Frequencies for a list of Channels. However, if you are setting up a Wireless Distribution System (WDS), it must be disabled. See Wireless Distribution System (WDS) for more information.
Frequency Channel	When Auto Channel Select is enabled, this field is read-only and displays the Access Point's current operating channel. When Auto Channel Select is disabled, you can specify the Access Point's operating channel. If you decide to manually set the unit's channel, ensure that nearby devices do not use the same frequency (unless you are setting up a WDS). Available Channels vary based on regulatory domain. See 802.11b Channel Frequencies.

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Parameter	Description
Distance Between APs	Set to **Large**, **Medium**, **Small**, **Microcell**, or **Minicell** depending on the site survey for your system. By default, this parameter is set to **Large**. The distance value is related to the **Multicast Rate** (described next). In general, a larger distance between APs means that your clients operate a slower data rates (on average). See Distance Between APs for more information.

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<table>
<tr><th>Parameter</th><th>Description</th></tr>
<tr><td>Multicast Rate</td><td>Sets the rate at which Multicast messages are sent. This value is related to the Distance Between APs parameter (described previously). The table below displays the possible Multicast Rates based on the Distance between APs setting. By default, this parameter is set to 2 Mbits/sec. See Multicast Rate for more information.
<table>
<tr><th>Distance between APs</th><th>Multicast Rate</th></tr>
<tr><td>Large</td><td>1 and 2 Mbits/sec</td></tr>
<tr><td>Medium</td><td>1, 2, and 5.5 Mbits/sec</td></tr>
<tr><td>Small</td><td>1, 2, 5.5 and 11 Mbits/sec</td></tr>
<tr><td>Minicell</td><td>1, 2, 5.5 and 11 Mbits/sec</td></tr>
<tr><td>Microcell</td><td>1, 2, 5.5 and 11 Mbits/sec</td></tr>
</table>
</td></tr>
</table>

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Parameter	Description
DTIM Period	The Deferred Traffic Indicator Map (DTIM) is used with clients that have power management enabled. DTIM should be left at 1, the default value, if any clients have power management enabled. This parameter supports a range between 1 and 255.
RTS/CTS Medium Reservation	This parameter affects message flow control and should not be changed under normal circumstances. Range is 0 to 2347. When set to a value between 0 and 2347, the Access Point uses the RTS/CTS mechanism for packets that are the specified size or greater. When set to 2347 (the default setting), RTS/CTS is disabled. See RTS/CTS Medium Reservation for more information.

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Parameter	Description
Interference Robustness	Enable this option if other electrical devices in the 2.4 GHz frequency band (such as a microwave oven or a cordless phone) may be interfering with the wireless signal. The AP will automatically fragment large packets into multiple smaller packets when interference is detected to increase the likelihood that the messages will be received in the presence of interference. The receiving radio reassembles the original packet once all fragments have been received. This option is disabled by default.
Closed System	Check this box to allow only clients configured with the Access Point's specific Network Name to associate with the Access Point. When enabled, a client configured with the Network Name "ANY" cannot connect to the AP. This option is disabled by default.

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Parameter	Description
Load Balancing	Enable this option so clients can evaluate which Access Point to associate with, based on current AP loads. This feature is enabled by default; it helps distribute the wireless load between APs. This feature is not available if you are using an Avaya 802.11a/b Card or a non-Avaya Wireless client with the AP.
Medium Density Distribution	When enabled, the Access Point automatically notifies wireless clients of its **Distance Between APs**, **Interference Robustness**, and **RTS/CTS Medium Reservation** settings. This feature is **enabled by default** and allows clients to automatically adopt the values used by its current Access Point (even if these values differ from the client's default values or from the values supported by other Access Points). **NOTE:** This feature is not available if you are using an Avaya 802.11a/b Card or a non-Avaya Wireless client with the AP. Avaya recommends that you leave this parameter enabled, particularly if you have Avaya Wireless clients on your wireless network (leaving this parameter enabled should not adversely affect the performance of any Avaya 802.11a/b Cards or non-Avaya Wireless cards on your network).

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Distance Between APs

Distance Between APs defines how far apart (physically) your AP devices are located, which in turn determines the size of your cell. Cells of different sizes have different capacities and, therefore, suit different applications. For instance, a typical office has many stations that require high bandwidth for complex, high-speed data processing. In contrast, a typical warehouse has a few forklifts requiring low bandwidth for simple transactions.

NOTE:
This feature is not available if you are using an Avaya 802.11a/b Card or a non-Avaya Wireless client with the AP.

Cell capacities are compared in the following table, which shows that small cells suit most offices and large cells suit most warehouses:

Small Cell	Large Cell
Physically accommodates few stations	Physically accommodates many stations
High cell bandwidth per station	Lower cell bandwidth per station
High transmit rate	Lower transmit rate

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Coverage

The number of Access Points in a set area determines the network coverage for that area. A large number of Access Points covering a small area is a high-density cell. A few Access Points, or even a single unit, covering the same small area would result in a low-density cell, even though in both cases the actual area did not change — only the number of Access Points covering the area changed.

In a typical office, a high density area consists of a number of Access Points installed every 20 feet and each Access Point generates a small radio cell with a diameter of about 10 feet. In contrast, a typical warehouse might have a low density area consisting of large cells (with a diameter of about 90 feet) and Access Points installed every 200 feet.

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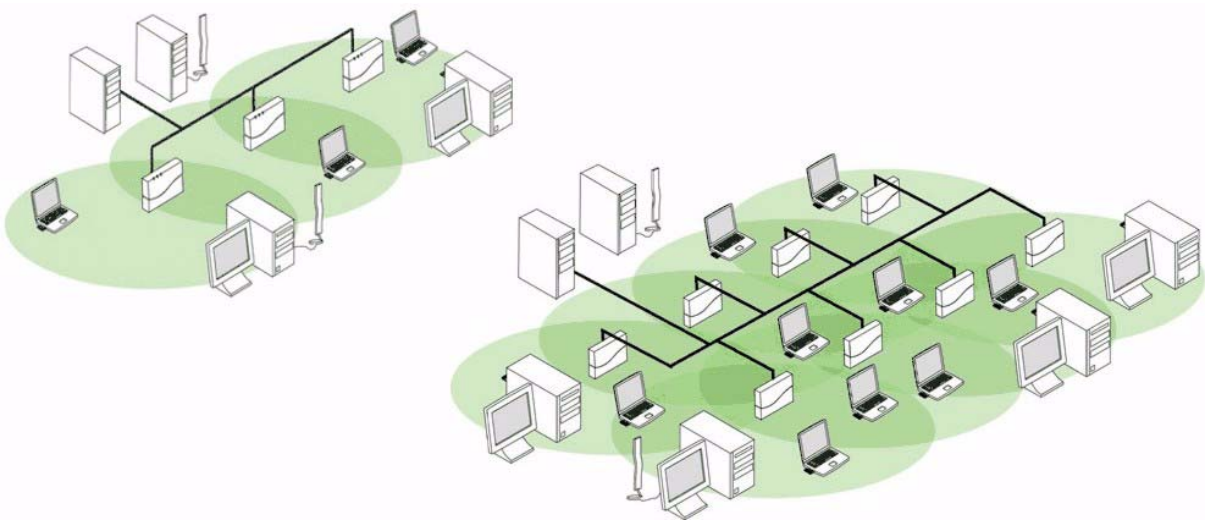
Figure 4-5. Low Density vs. Ultra High Density Network



The Distance Between Cells parameter supports five values: Large, Medium, Small, Minicell, and Microcell.

⚠ CAUTION:

The distance between APs should not be approximated. It is calculated by means of a manual Site Survey, in which an AP is set up and clients are tested throughout the area to determine signal strength and coverage, and local limits such as physical interference are investigated. From these measurements the appropriate cell size and density is determined, and the optimum distance between APs is calculated to suit your particular business requirements. Contact your reseller for information on how to conduct a Site Survey.

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Multicast Rate

The multicast rate determines the rate at which broadcast and multicast packets are transmitted by the Access Point to the wireless network. Stations that are closer to the Access Point can receive multicast packets at a faster data rate than stations that are farther away from the AP.

You should set the Multicast Rate based on the size of the Access Point's cell.

If the Access Point's cell is very small (for example, Distance Between APs is set to Microcell), you can expect that all stations should be able to successfully receive multicast packets at 11 MBits/sec so you can set Multicast Rate to 11 Mbits/sec. However, if the Access Point's cell is large, you need to accommodate stations that may not be able to receive multicast packets at the higher rates; in this case, you should set Multicast Rate to 1 or 2 Mbits/sec.

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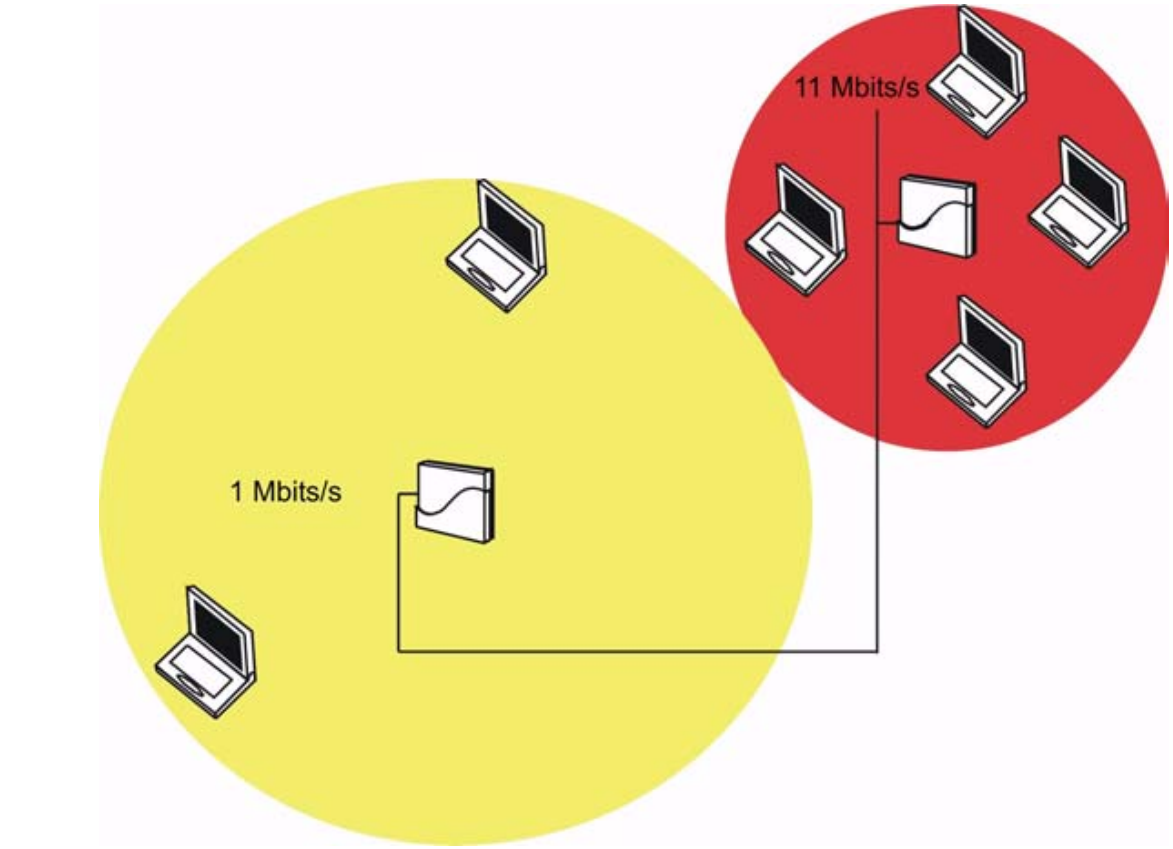
Figure 4-6. 1 Mbits/s and 11 Mbits/s Multicast Rates



NOTE:
There is an inter-dependent relationship between the Distance between APs and the Multicast Rate. In general, larger systems operate at a lower average transmit rate. The variation between Multicast Rate and Distance Between APs is presented in the following table:

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	1.0 Mbit/s	2.0 Mbits/s	5.5 Mbits/s	11 Mbits/s
Large	yes	yes		
Medium	yes	yes	yes	
Small	yes	yes	yes	yes
Minicell	yes	yes	yes	yes
Microcell	yes	yes	yes	yes

The Distance Between APs **must be set before** the Multicast Rate, because when you select the Distance Between APs, the appropriate range of Multicast values automatically populates the drop-down menu.

Wireless Distribution System (WDS)

A Wireless Distribution System (WDS) creates a link between two 802.11b APs over their radio interfaces. This link relays traffic from one 802.11b AP that does not have Ethernet connectivity to a second 802.11b AP that has Ethernet connectivity. WDS allows you to configure up to six (6) point-to-point links between Access Points.

In the WDS Example that follows, AP 1 and AP 2 communicate over a WDS link (represented by the blue line). This link provides Client 1 with access to network resources even though AP 1 is not directly connected to the Ethernet network. Packets destined for or sent by the client are relayed between the Access Points over the WDS link.

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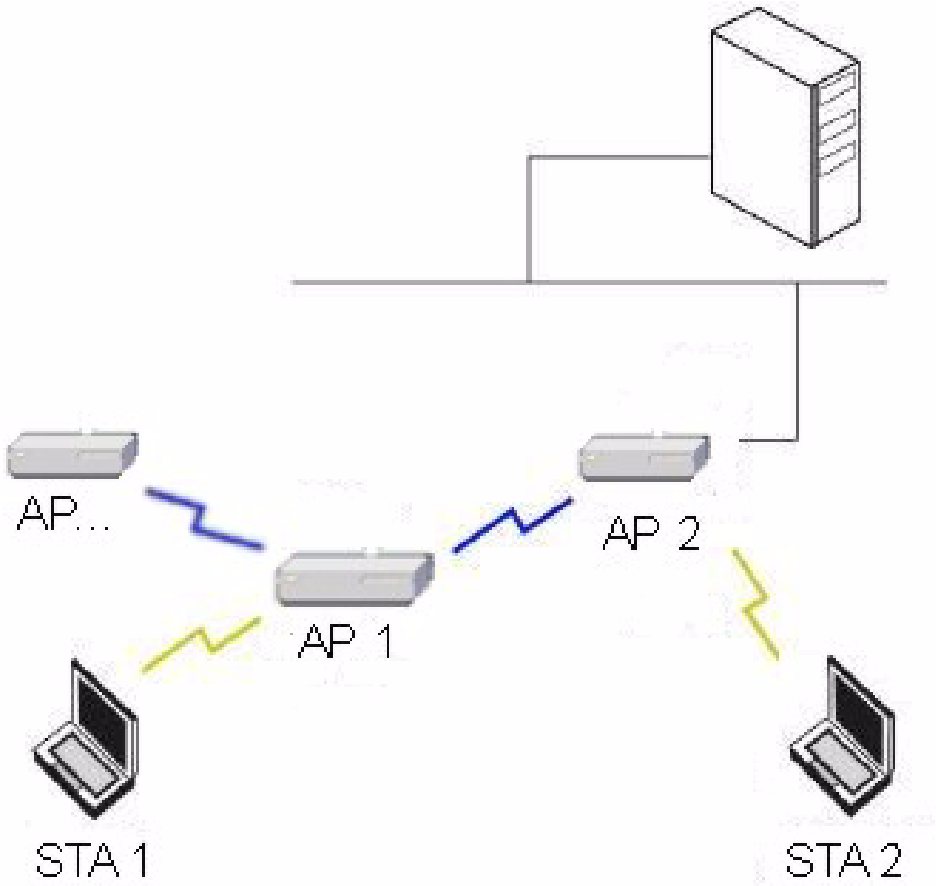
NOTE:
This feature is not available with an 802.11a or 802.11b/g AP.

Figure 4-7. WDS Example



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Bridging WDS

Each WDS link is mapped to a logical WDS port on the 802.11b AP. WDS ports behave like Ethernet ports rather than like standard wireless interfaces: on a BSS port, an Access Point learns by association and from frames; on a WDS or Ethernet port, an Access Point learns from frames only. When setting up a WDS, keep in mind the following:

Communication Bandwidth: The WDS link shares the communication bandwidth with the clients. Therefore, while the maximum data rate for the Access Point's cell is still 11 Mb, client throughput will decrease when the WDS link is active.

Partner MAC Address:

- If there is no partner MAC address configured in the WDS table, the WDS port remains disabled.
- Each WDS port on a single 802.11b AP should have a unique partner MAC address. Do not enter the same MAC address twice in an AP's WDS port list.

Channel: Each Access Point that is a member of the WDS must have the same Channel setting to communicate with each other.

WEP Encryption: Each Access Point that is a member of the WDS must have the same WEP Encryption settings. WDS does not use 802.1x. Therefore, if you want to encrypt the WDS link, you must configure each Access Point to use WEP encryption (either WEP encryption only or Mixed Mode), and each Access Point must have the same Encryption Key(s). See Security.

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Spanning Tree: If your network does not support spanning tree, be careful to avoid creating network loops between APs. For example, creating a WDS link between two Access Points connected to the same Ethernet network will create a network loop (if spanning tree is disabled).

WDS Setup Procedure

NOTE:
You must disable Auto Channel Select to create a WDS.

To setup a wireless backbone follow the steps below for each 802.11b AP that you wish to include in the Wireless Distribution System.

1. Confirm that Auto Channel Select is disabled.
2. Write down the MAC Address of the radio that you wish to include in the Wireless Distribution System.
3. Open the ***Wireless Interface Configuration*** screen.
4. Scroll down to the **Wireless Distribution System** heading.
5. Click the **Edit** button to update the Wireless Distribution System (WDS) Table.
6. Enter the MAC Address that you wrote down in Step 2 in one of the **Partner MAC Address** field of the Wireless Distribution Setup window.
7. Set the **Status** of the device to **Enable**.
8. Click **OK**.
9. Restart the AP.

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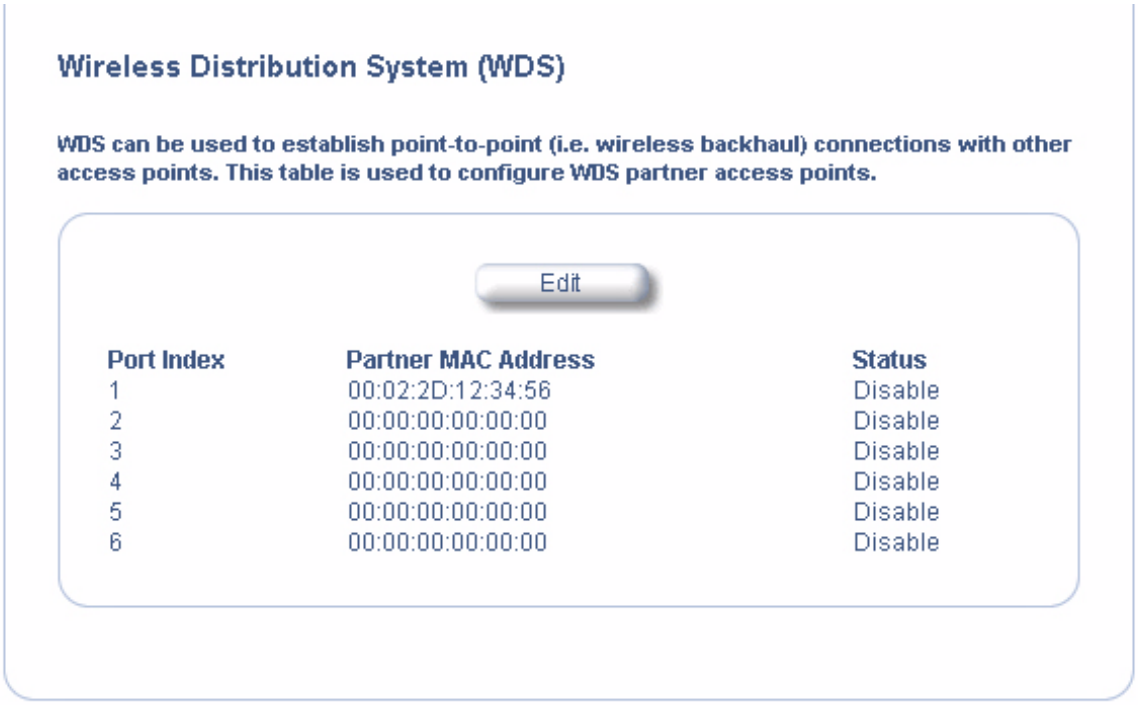
Figure 4-8. WDS Configuration


Wireless Distribution System (WDS)
WDS can be used to establish point-to-point (i.e. wireless backhaul) connections with other access points. This table is used to configure WDS partner access points.
Edit
Port Index
Partner MAC Address
Status
1 00:02:2D:12:34:56 Disable
2 00:00:00:00:00:00 Disable
3 00:00:00:00:00:00 Disable
4 00:00:00:00:00:00 Disable
5 00:00:00:00:00:00 Disable
6 00:00:00:00:00:00 Disable

NOTE:
To set up a Wireless Distribution System (WDS) with 802.1x, set each Access Point's 802.1x Security Mode to Mixed and assign each unit in the WDS the same Encryption Key 1. See Security.

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Wireless (802.11b/g)

You can configure the following radio parameters for an 802.11b/g AP:

NOTE:
You must reboot the Access Point before any changes to these parameters take effect.

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Parameter	Description
Operational Mode	An 802.11b/g wireless interface can be configured to operate in the following modes: • **802.11b mode only:** The radio uses the 802.11b standard only. • **802.11g mode only:** The radio is optimized to communicate with 802.11g devices. This setting will provide the best results if this radio interface will only communicate with 802.11g devices. • **802.11bg mode:** This is the default mode. Use this mode if you want to support a mix of 802.11b and 802.11g devices. • **802.11g-wifi:** This mode was developed for Wi-Fi compliance testing purposes. It is similar to 802.11g only mode. In general, you should use either 802.11g only mode (if you want to support 802.11g devices only) or 802.11bg mode to support a mix of 802.11b and 802.11g devices.

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Parameter	Description
Physical Interface Type	Depending on the Operational Mode, this field reports: • **For 802.11b mode only:** "802.11b (CCK/DSSS 2.4 GHz)" • **For 802.11g and 802.11g-wifi modes:** "802.11g (OFDM/DSSS 2.4 GHz)" • **For 802.11bg mode:** "802.11b/g (ERP-CCK/DSSS/OFDM 2.4 GHz)" OFDM stands for Orthogonal Frequency Division Multiplexing; this is the name for the radio technology used by 802.11a devices. DSSS stands for Direct Sequence Spread Spectrum; this is the name for the radio technology used by 802.11b devices.
MAC Address	This is a read-only field that displays the unique MAC (Media Access Control) address for the Access Point's wireless interface. The MAC address is assigned at the factory.

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Parameter	Description
Regulatory Domain	Reports the regulatory domain for which the AP is certified. Not all features or channels are available in all countries. The available regulatory domains include: • FCC - U.S./Canada, Mexico, and Australia • ETSI - Europe, including the United Kingdom, China, and South Korea • MKK - Japan • IL - Israel
Network Name (SSID)	Enter a Network Name (between 1 and 32 characters long) for the wireless network. You must configure each wireless client to use this name as well.
Auto Channel Select	The AP scans the area for other Access Points and selects a free or relatively unused communication channel. This helps prevent interference problems and increases network performance. By default this feature is enabled; see 802.11g Channel Frequencies for a list of Channels.

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Parameter	Description
Frequency Channel	When Auto Channel Select is enabled, this field is read-only and displays the Access Point's current operating channel. When Auto Channel Select is disabled, you can specify the Access Point's operating channel. If you decide to manually set the unit's channel, ensure that nearby devices do not use the same frequency (unless you are setting up a WDS). Available Channels vary based on regulatory domain. See 802.11g Channel Frequencies.
Transmit Rate	Select a specific transmit rate for the AP. The values available depend on the Operational Mode. Auto Fallback is the default setting; it allows the AP to select the best transmit rate based on the cell size. • **For 802.11b only** -- Auto Fallback, 1, 2, 5.5, 11 Mbits/sec • **For 802.11g only** -- Auto Fallback, 6, 9, 12, 18, 24, 36, 48, 54 Mbits/sec • **For 802.11bg and 802.11g-wifi** -- Auto Fallback, 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, 54 Mbits/sec

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Parameter	Description
DTIM Period	The Deferred Traffic Indicator Map (DTIM) is used with clients that have power management enabled. DTIM should be left at 1, the default value, if any clients have power management enabled. This parameter supports a range between 1 and 255.
RTS/CTS Medium Reservation	This parameter affects message flow control and should not be changed under normal circumstances. Range is 0 to 2347. When set to a value between 0 and 2347, the Access Point uses the RTS/CTS mechanism for packets that are the specified size or greater. When set to 2347 (the default setting), RTS/CTS is disabled. See RTS/CTS Medium Reservation for more information.
Closed System	Check this box to allow only clients configured with the Access Point's specific Network Name to associate with the Access Point. When enabled, a client configured with the Network Name "ANY" cannot connect to the AP. This option is disabled by default.

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Ethernet

Select the desired speed and transmission mode from the drop-down menu. Half-duplex means that only one side can transmit at a time and full-duplex allows both sides to transmit. When set to auto-duplex, the AP negotiates with its switch or hub to automatically select the highest throughput option supported by both sides.

For best results, Avaya recommends that you configure the Ethernet setting to match the speed and transmission mode of the device the Access Point is connected to (such as a hub or switch). If in doubt, leave this setting at its default, **auto-speed-auto-duplex**. Choose between:

- 10 Mbit/s - half duplex, full duplex, or auto duplex
- 100 Mbit/s - half duplex or full duplex
- auto speed - half duplex or auto duplex

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Management

The Management category contains three sub-categories.

- Passwords
- IP Access Table
- Services

Passwords

You can configure the following passwords:

Type	Description
SNMP Read Password	For read access to the AP using SNMP. Enter a password in both the **Password** field and the **Confirm** field. The default password is “public”.
SNMP Read/Write Password	For read and write access to the AP using SNMP. Enter a password in both the **Password** field and the **Confirm** field. The default password is “public”.
Telnet (CLI) Password	For the CLI interface (via serial or Telnet). Enter a password in both the **Password** field and the **Confirm** field. The default password is “public”.

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Type	Description
HTTP (Web) Password	For the Web browser HTTP interface. Enter a password in both the **Password** field and the **Confirm** field. The default password is “public”.

NOTE:
For security purposes Avaya recommends changing ALL PASSWORDS from the default “public” immediately, to restrict access to your network devices to authorized personnel. If you lose or forget your password settings, you can always perform the Reset to Factory Default Procedure.

IP Access Table

The Management IP Access table limits in-band management access to the IP addresses or range of IP addresses specified in the table. This feature applies to all management options (SNMP, HTTP, and CLI) except for CLI management over the serial port. To configure this table, click **Add** and set the following parameters:

- **IP Address:** Enter the IP Address for the management station.
- **IP Mask:** Enter a mask that will act as a filter to limit access to a range of IP Addresses based on the IP Address you already entered.

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— The IP mask 255.255.255.255 would authorize the single station defined by the IP Address to configure the Access Point. The AP would ignore commands from any other IP address. In contrast, the IP mask 255.255.255.0 would allow any device that shares the first three octets of the IP address to configure the AP. For example, if you enter an IP address of 10.20.30.1 with a 255.255.255.0 subnet mask, any IP address between 10.20.30.1 and 10.20.30.254 will have access to the AP's management interfaces.

- **Comment:** Enter an optional comment, such as the station name.

To edit or delete an entry, click **Edit**. Edit the information, or select **Enable**, **Disable**, or **Delete** from the **Status** pull-down menu.

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Services

You can configure the following management services:

NOTE:
You must reboot the Access Point if you change the HTTP Port or Telnet Port.

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SNMP Settings

Setting	Description
SNMP Interface Bitmask	Configure the interface or interfaces (**Ethernet**, **Wireless**, **All Interfaces**) from which you will manage the AP via SNMP. You can also select **Disabled** to prevent a user from accessing the AP via SNMP.

HTTP Access

Setting	Description
HTTP Interface Bitmap	Configure the interface or interfaces (**Ethernet**, **Wireless**, **All Interfaces**) from which you will manage the AP via the Web interface. For example, to allow Web configuration via the Ethernet network only, set **HTTP Interface Bitmask** to **Ethernet**. You can also select **Disabled** to prevent a user from accessing the AP from the Web interface.

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Setting	Description
HTTP Port	Configure the HTTP port from which you will manage the AP via the Web interface. By default, the HTTP port is 80.
Enable HTTP Setup Wizard	The Setup Wizard appears automatically the first time you access the HTTP interface. If you exited out of the Setup Wizard and want to relaunch it, enable this option, click **OK**, and then close your browser or reboot the AP. The Setup Wizard will appear the next time you access the HTTP interface.

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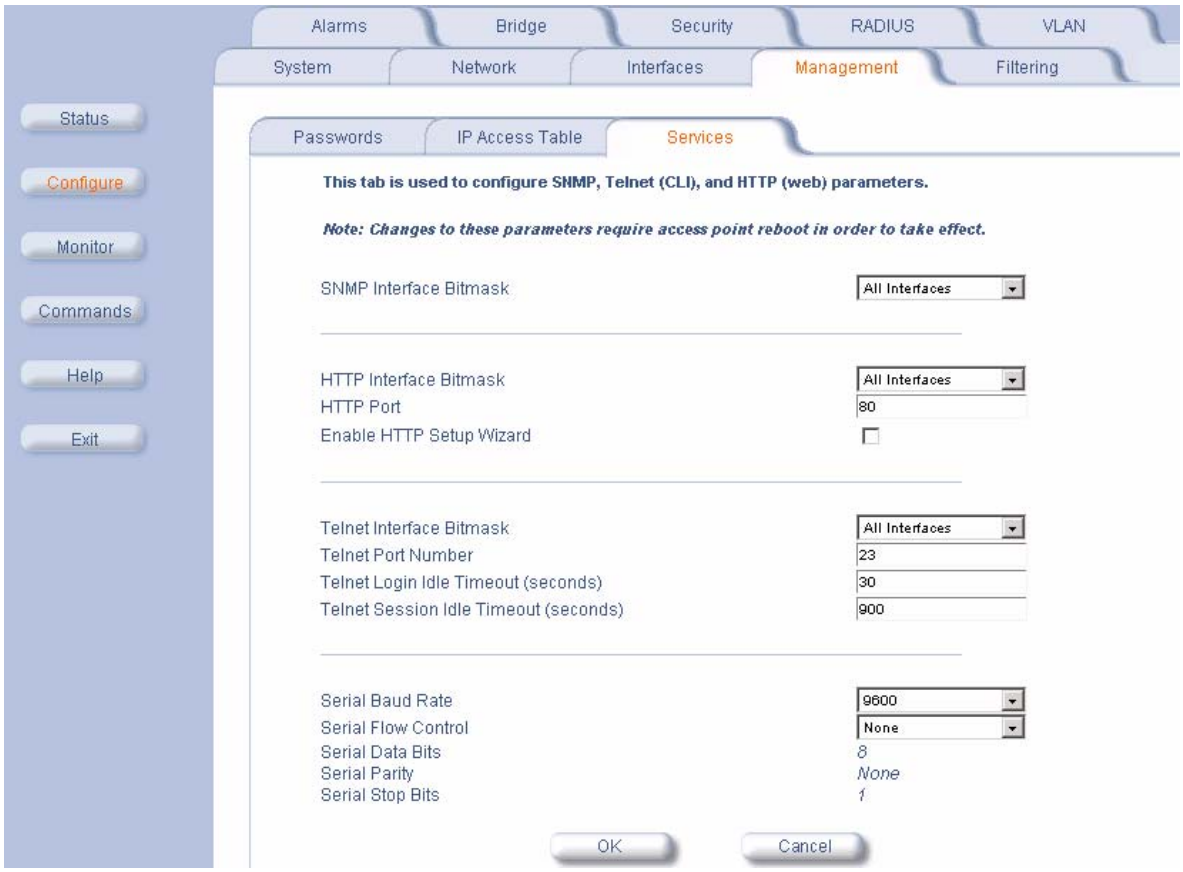
Figure 4-9. Management Services Configuration Screen



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Telnet Configuration Settings

Setting	Description
Telnet Interface Bitmask	Select the interface (**Ethernet**, **Wireless**, **All Interfaces**) from which you can manage the AP via telnet. This parameter can also be used to Disable telnet management.
Telnet Port	The default port number for Telnet applications is 23. However, you can use this field if you want to change the Telnet port for security reasons (but your Telnet application also must support the new port number you select).
Login Idle Timeout (seconds)	Enter the number of seconds the system will wait for a login attempt. The AP terminates the session when it times out. The range is 1 to 300 seconds; the default is 30 seconds.
Session Idle Timeout (seconds)	Enter the number of seconds the system will wait during a session while there is no activity. The AP will terminate the session on timeout. The range is 1 to 36000 seconds; the default is 900 seconds.

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Serial Configuration Settings

The serial port interface on the AP is enabled at all times. See Setting IP Address using Serial Port for information on how to access the CLI interface via the serial port. You can configure and view following parameters:

Setting	Description
Baud Rate	Select the serial port speed (bits per second). Choose between 2400, 4800, 9600, 19200, 38400, or 57600; the default Baud Rate is 9600.
Flow Control	Select either **None** (default) or **Xon/Xoff** (software controlled) data flow control. **NOTE:** To avoid potential problems when communicating with the AP through the serial port, Avaya recommends that you leave the Flow Control setting at None (the default value).
Serial Data Bits	This is a read-only field and displays the number of data bits used in serial communication (8 data bits by default).

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Setting	Description
Serial Parity	This is a read-only field and displays the number of parity bits used in serial communication (no parity bits by default).
Serial Stop Bits	This is a read-only field that displays the number of stop bits used in serial communication (1 stop bit by default). **NOTE:** The serial port bit configuration is commonly referred to as **8N1**.

Filtering

The Access Point's Packet Filtering features help control the amount of traffic exchanged between the wired and wireless networks. There are four sub-categories under the Filtering heading.

- Ethernet Protocol
- Static MAC
- Advanced
- TCP/UDP Port

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Ethernet Protocol

The Ethernet Protocol Filter blocks or forwards packets based on the Ethernet protocols they support.

Follow these steps to configure the Ethernet Protocol Filter:

1. Select the interface or interfaces that will implement the filter from the **Ethernet Protocol Filtering** drop-down menu.
   - — **Ethernet:** Packets are examined at the Ethernet interface
   - — **Wireless:** Packets are examined at the Wireless interface
   - — **All Interfaces:** Packets are examined at both interfaces
   - — **Disabled:** The filter is not used

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2. Select the **Filter Operation Type**.

   — If set to **Passthru**, only the enabled Ethernet Protocols listed in the Filter Table will pass through the bridge.

   — If set to **Block**, the bridge will block enabled Ethernet Protocols listed in the Filter Table.

3. Configure the **Ethernet Protocol Filter Table**. This table is pre-populated with existing Ethernet Protocol Filters, however, you may enter additional filters by specifying the appropriate parameters.

   — To add an entry, click **Add**, and then specify the **Protocol Number** and a **Protocol Name**.

   - **Protocol Number:** Enter the protocol number. See http://www.iana.org/assignments/ethernet-numbers for a list of protocol numbers.
   - **Protocol Name:** Enter related information, typically the protocol name.

   — To edit or delete an entry, click **Edit** and change the information, or select **Enable**, **Disable**, or **Delete** from the **Status** drop-down menu.

   — An entry's status must be enabled in order for the protocol to be subject to the filter.

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Static MAC

The Static MAC Address filter optimizes the performance of a wireless (and wired) network. When this feature is properly configured, the AP can block traffic between wired devices and wireless devices based on MAC address.

For example, you can set up a Static MAC filter to prevent wireless clients from communicating with a specific server on the Ethernet network. You can also use this filter to block unnecessary multicast packets from being forwarded to the wireless network.

NOTE:
The Static MAC Filter is an advanced feature. You may find it easier to control wireless traffic via other filtering options, such as Ethernet Protocol Filtering.

Each static MAC entry contains the following fields:

- **Wired MAC Address**
- **Wired Mask**
- **Wireless MAC Address**
- **Wireless Mask**
- **Comment:** This field is optional.

Each MAC Address or Mask is comprised of 12 hexadecimal digits (0-9, A-F) that correspond to a 48-bit identifier. (Each hexadecimal digit represents 4 bits (0 or 1).)

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Taken together, a MAC Address/Mask pair specifies an address or a range of MAC addresses that the AP will look for when examining packets. The AP uses Boolean logic to perform an “AND” operation between the MAC Address and the Mask at the bit level. However, for most users, you do not need to think in terms of bits. It should be sufficient to create a filter using only the hexadecimal digits 0 and F in the Mask (where 0 is any value and F is the value specified in the MAC address). A Mask of 00:00:00:00:00:00 corresponds to all MAC addresses, and a Mask of FF:FF:FF:FF:FF:FF applies only to the specified MAC Address.

Example

For example, if the MAC Address is 00:20:A6:12:54:C3 and the Mask is FF:FF:FF:00:00:00, the AP will examine the source and destination addresses of each packet looking for any MAC address starting with 00:20:A6. If the Mask is FF:FF:FF:FF:FF:FF, the AP will only look for the specific MAC address (in this case, 00:20:A6:12:54:C3).

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When creating a filter, you can configure the Wired parameters only, the Wireless parameters only, or both sets of parameters. Which parameters to configure depends upon the traffic that you want block:

To block all traffic ...	Configure ...
from a specific wired MAC address from being forwarded to the wireless network	only the Wired MAC Address and Wired Mask (leave the Wireless MAC Address and Wireless Mask set to all zeros).
from a specific wireless MAC address from being forwarded to the wired network	only the Wireless MAC address and Wireless Mask (leave the Wired MAC Address and Wired Mask set to all zeros).
between a specific wired MAC address and a specific wireless MAC address	all four parameters.

Creating an Entry

To create an entry, click **Add** and enter the appropriate MAC addresses and Masks to setup a filter. The entry is enabled automatically when saved. To edit an entry, click **Edit**. To disable or remove an entry, click **Edit** and change the **Status** field from **Enable** to **Disable** or **Delete**.

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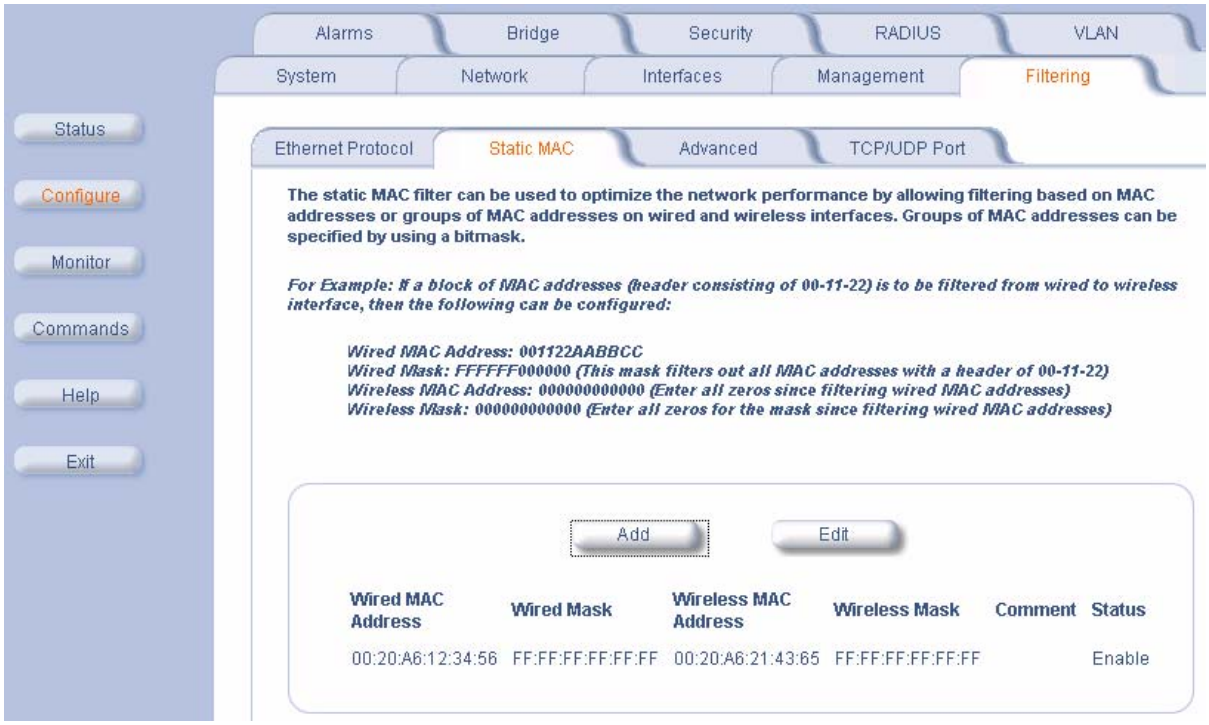
Figure 4-10. Static MAC Configuration Screen



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Static MAC Filter Examples

Consider a network that contains a wired server and three wireless clients. The MAC address for each unit is as follows:

- Wired Server: 00:40:F4:1C:DB:6A
- ireless Client 1: 00:02:2D:51:94:E4
- Wireless Client 2: 00:02:2D:51:32:12
- Wireless Client 3: 00:20:A6:12:4E:38

Prevent Two Specific Devices from Communicating

Configure the following settings to prevent the Wired Server and Wireless Client 1 from communicating:

- **Wired MAC Address:** 00:40:F4:1C:DB:6A
- **Wired Mask:** FF:FF:FF:FF:FF:FF
- **Wireless MAC Address:** 00:02:2D:51:94:E4
- **Wireless Mask:** FF:FF:FF:FF:FF:FF

Result: Traffic between the Wired Server and Wireless Client 1 is blocked. Wireless Clients 2 and 3 can still communicate with the Wired Server.

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Prevent Multiple Wireless Devices From Communicating With a Single Wired Device

Configure the following settings to prevent Wireless Clients 1 and 2 from communicating with the Wired Server.

- **Wired MAC Address:** 00:40:F4:1C:DB:6A
- **Wired Mask:** FF:FF:FF:FF:FF:FF
- **Wireless MAC Address:** 00:02:2D:51:94:E4
- **Wireless Mask:** FF:FF:FF:00:00:00

Result: When a logical “AND” is performed on the Wireless MAC Address and Wireless Mask, the result corresponds to any MAC address beginning with the 00:20:2D prefix. Since Wireless Client 1 and Wireless Client 2 share the same prefix (00:02:2D), traffic between the Wired Server and Wireless Clients 1 and 2 is blocked. Wireless Client 3 can still communicate with the Wired Server since it has a different prefix (00:20:A6).

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Prevent All Wireless Devices From Communicating With a Single Wired Device

Configure the following settings to prevent all three Wireless Clients from communicating with Wired Server 1.

- **Wired MAC Address:** 00:40:F4:1C:DB:6A
- **Wired Mask:** FF:FF:FF:FF:FF:FF
- **Wireless MAC Address:** 00:00:00:00:00:00
- **Wireless Mask:** 00:00:00:00:00:00

Result: The Access Point blocks all traffic between Wired Server 1 and all wireless clients.

Prevent A Wireless Device From Communicating With the Wired Network

Configure the following settings to prevent Wireless Client 3 from communicating with any device on the Ethernet.

- **Wired MAC Address:** 00:00:00:00:00:00
- **Wired Mask:** 00:00:00:00:00:00
- **Wireless MAC Address:** 00:20:A6:12:4E:38
- **Wireless Mask:** FF:FF:FF:FF:FF:FF

Result: The Access Point blocks all traffic between Wireless Client 3 and the Ethernet network.

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Prevent Messages Destined for a Specific Multicast Group from Being Forwarded to the Wireless LAN

If there are devices on your Ethernet network that use multicast packets to communicate and these packets are not required by your wireless clients, you can set up a Static MAC filter to preserve wireless bandwidth. For example, if routers on your network use a specific multicast address (such as 01:00:5E:00:32:4B) to exchange information, you can set up a filter to prevent these multicast packets from being forwarded to the wireless network:

- **Wired MAC Address:** 01:00:5E:00:32:4B
- **Wired Mask:** FF:FF:FF:FF:FF:FF
- **Wireless MAC Address:** 00:00:00:00:00:00
- **Wireless Mask:** 00:00:00:00:00:00

Result: The Access Point does not forward any packets that have a destination address of 01:00:5E:00:32:4B to the wireless network.

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Advanced

You can configure the following advanced filtering options:

- **Enable Proxy ARP:** Place a check mark in the box provided to allow the Access Point to respond to Address Resolution Protocol (ARP) requests for wireless clients. When enabled, the AP answers ARP requests for wireless stations without actually forwarding them to the wireless network. If disabled, the Access Point will bridge ARP requests for wireless clients to the wireless LAN.
- **Enable IP/ARP Filtering:** Place a check mark in the box provided to allow IP/ARP filtering based on the IP/ARP Filtering Address and IP Mask. Leave the box unchecked to prevent filtering. If enabled, you should also configure the IP/ARP Filtering Address and IP/ARP IP Mask.
  - — **IP/ARP Filtering Address:** Enter the Network filtering IP Address.
  - — **IP/ARP IP Mask:** Enter the Network Mask IP Address.

The following protocols are listed in the Advanced Filter Table:

- **Deny IPX RIP**
- **Deny IPX SAP**
- **Deny IPX LSP**
- **Deny IP Broadcasts**
- **Deny IP Multicasts**

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The AP can filter these protocols in the wireless-to-Ethernet direction, the Ethernet-to-wireless direction, or in both directions. Click **Edit** and use the **Status** field to Enable or Disable the filter.

TCP/UDP Port

Port-based filtering enables you to control wireless user access to network services by selectively blocking TCP/UDP protocols through the AP. A user specifies a Protocol Name, Port Number, Port Type (TCP, UDP, or TCP/UDP), and filtering interfaces (Wireless only, Ethernet only, all interfaces, or no interfaces) in order to block access to services, such as Telnet and FTP, and traffic, such as NETBIOS and HTTP.

For example, an AP with the following configuration would discard frames received on its Ethernet interface with a UDP destination port number of 137, effectively blocking NETBIOS Name Service packets.

Protocol Type (TCP/UDP)	Destination Port Number	Protocol Name	Interface	Status (Enable/Disable)
UDP	137	NETBIOS Name Service	Ethernet	Enable

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Adding TCP/UDP Port Filters

1. Place a check mark in the box labeled **Enable TCP/UDP Port Filtering**.
2. Click **Add** under the ***TCP/UDP Port Filter Table*** heading.
3. In the ***TCP/UDP Port Filter Table***, enter the Protocol Names to filter.
4. Set the destination Port Number (a value between 0 and 65535) to filter. See the IANA Web site at http://www.iana.org/assignments/port-numbers for a list of assigned port numbers and their descriptions.
5. Set the Port Type for the protocol: **TCP**, **UDP**, or both (**TCP/UDP**).
6. Set the **Interface** to filter:
   - — Wireless
   - — Ethernet
   - — All interfaces
   - — No interfaces
7. Click **OK**.

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Editing TCP/UDP Port Filters

1. Click **Edit** under the ***TCP/UDP Port Filter Table*** heading.
2. Make any changes to the Protocol Name or Port Number for a specific entry, if necessary.
3. In the row that defines the port, set the **Status** to **Enable**, **Disable**, or **Delete**, as appropriate.
4. Select **OK**.

Alarms

This category has three sub-categories.

- Groups
- Alarm Host Table
- Syslog

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Groups

There are seven alarm groups that can be enabled or disabled via the Web interface. Place a check mark in the box provided to enable a specific group. Remove the check mark from the box to disable the alarms. Alarm Severity Levels vary.

- **Configuration Alarm**

Trap Name	Description
oriTrapDNSIPNotConfigured	This traps is generated when the DNS IP Address has not been configured. Severity Level: Major

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- **Security Alarms**

Trap Name	Description
oriTrapAuthenticationFailure	This trap is generated when a client authentication failure occurs. The authentication failures can range from: - MAC Access Control Table - RADIUS MAC Authentication - 802.1x Authentication specifying the EAP-Type Severity Level: Major
oriTrapUnauthorizedManagerDetected	This trap is generated when an unauthorized manager has attempted to view and/or modify parameters. Severity Level: Major

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- **Wireless Alarms**

Trap Name	Description
oriTrapWLCNotPresent	When you start the AP, this trap is generated when a wireless interface/card is not present in the AP. Severity Level: Informational
oriTrapWLCFailure	This trap is generated when a general failure occurs with the wireless interface/card. Severity Level: Critical
oriTrapWLCRemoval	This trap is generated when the wireless interface/card has been removed from the device. Severity Level: Critical
oriTrapWLCIncompatibleFirmware	This trap is generated when the firmware of the wireless interface/card is incompatible with the AP. Severity Level: Critical

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oriTrapWLCVoltageDiscrepancy	The dual-radio AP supports 3.3 V and 5 V wireless cards. This trap is generated when a wireless interface/card using a different voltage is inserted in the AP. Severity Level: Critical
oriTrapWLCIncompatibleVendor	This trap is generated when an incompatible wireless vendor card is inserted or present in the AP. Severity Level: Critical
oriTrapWLCFirmwareDownloadFailure	This trap is generated when a failure occurs during the firmware download process of the wireless interface/card. Severity Level: Critical

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- **Operational Alarms**

Trap Name	Description
oriTrapWatchDogTimerExpired	This trap is generated when the software watch dog timer expires. This indicates that a problem has occurred with one or more software modules and the AP will reboot automatically. Trap Severity Level: Critical
oriTrapRADIUSServerNotResponding	This trap is generated when no response is received from the RADIUS server(s) for authentication requests sent from the RADIUS client in the AP. Trap Severity Level: Major
oriTrapModuleNotInitialized	This trap is generated when a certain software or hardware module is not initialized or fails to initialize. Trap Severity Level: Major
oriTrapDeviceRebooting	This trap is generated when the AP is rebooting. Trap Severity Level: Informational

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oriTrapTaskSuspended	This trap is generated when a software task in the AP is suspended. Trap Severity Level: Critical
oriTrapBootPFailed	In bootloader mode, this trap is generated when the AP does not receive a response from the BootP server. The result is that the Access Point reverts to its static IP configuration and you will need to set reset configuration options. Trap Severity Level: Major
oriTrapDHCPFailed	In operational mode, this trap is generated when the AP does not receive a response from the DHCP server. The result is that the Access Point reverts to its static IP configuration and you will need to set reset configuration options. Trap Severity Level: Major

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- **FLASH Memory Alarms**

Trap Name	Description
oriTrapFlashMemoryEmpty	This trap is generated when an error occurs while downloading a file to the AP and no data is present in the flash memory. Severity Level: Informational
oriTrapFlashMemoryCorrupted	This trap is generated when an error occurs while downloading a file to the AP and the data in the flash memory is invalid or corrupted. Severity Level: Critical

- **TFTP Alarms**

Trap Name	Description
oriTrapTFTPFailedOperation	This trap is generated when a failure occurs during a TFTP upload or download operation. Severity Level: Major
oriTrapTFTPOperationInitiated	This trap is generated when a TFTP upload or download operation is started. Severity Level: Informational

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oriTrapTFTPOperationCompleted	This trap is generated when a TFTP operation is complete (upload or download). Severity Level: Informational

- **Image Alarms**

Trap Name	Description
oriTrapZeroSizeImage	This trap is generated when a zero size image is loaded on the AP. Trap Severity Level: Major
oriTrapInvalidImage	This trap is generated when an invalid image is loaded in the Access Point. Trap Severity Level: Major
oriTrapImageTooLarge	This trap is generated when the image loaded in the AP exceeds the size limitation of the flash memory. Trap Severity Level: Major
oriTrapIncompatibleImage	This trap is generated when an incompatible image is loaded in the AP. Trap Severity Level: Major

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In addition, the AP supports these standard traps, which are always enabled:

- **RFC 1215-Trap**

Trap Name	Description
coldStart	The AP has been turned on or rebooted. Trap Severity Level: Informational
linkUp	The AP's Ethernet interface link is up (working). Trap Severity Level: Informational
linkDown	The AP's Ethernet interface link is down (not working). Trap Severity Level: Informational

- **Bridge MIB (RFC 1493) Alarms**

Trap Name	Description
newRoot	This trap indicates that the AP has become the new root in the Spanning Tree network. Trap Severity Level: Informational

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topologyChange	This trap is sent by the AP when any of its configured ports transitions from the Learning state to the Forwarding state, or from the Forwarding state to the Blocking state. This trap is not sent if a newRoot trap is sent for the same transition. Trap Severity Level: Informational

All these alarm groups correspond to System Alarms that are displayed in the System Status screen, including the traps that are sent by the AP to the SNMP managers specified in the Alarm Host Table.

Severity Levels

There are three severity levels for system alarms:

- Critical
- Major
- Informational

Critical alarms will often result in severe disruption in network activity or an automatic reboot of the AP

Major alarms are usually activated due to a breach in the security of the system. Clients cannot be authenticated or an attempt at unauthorized access into the AP has been detected.

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Informational alarms are there to provide the network administrator with some general information about the activities the AP is performing.

Alarm Host Table

To add an entry and enable the AP to send SNMP trap messages to a Trap Host, click **Add**, and then specify the IP Address and Password for the Trap Host.

- **IP Address:** Enter the Trap Host IP Address.
- **Password:** Enter the password in the **Password** field and the **Confirm** field.
- **Comment:** Enter an optional comment, such as the alarm (trap) host station name.

To edit or delete an entry, click **Edit**. Edit the information, or select **Enable**, **Disable**, or **Delete** from the **Status** drop-down menu.

Syslog

The Syslog messaging system enables the AP to transmit event messages to a central server for monitoring and troubleshooting. The access point logs “Session Start (Log-in)” and “Session Stop (Log-out)” events for each wireless client as an alternative to RADIUS accounting.

See RFC 3164 at http://www.rfc-editor.org for more information on the Syslog standard.

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Figure 4-11. Syslog Configuration Screen

Setting Syslog Event Notifications

Syslog Events are logged according to the level of detail specified by the administrator. Logging only urgent system messages will create a far smaller, more easily read log then a log of every event the system encounters. Determine which events to log by selecting a priority defined by the following scale:

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Event	Priority	Description
LOG_EMERG	0	system is unusable
LOG_ALERT	1	action must be taken immediately
LOG_CRIT	2	critical conditions
LOG_ERR	3	error conditions
LOG_WARNING	4	warning conditions
LOG_NOTICE	5	normal but significant condition
LOG_INFO	6	informational
LOG_DEBUG	7	debug-level messages

Configuring Syslog Event Notifications

You can configure the following Syslog settings from the HTTP interface:

- **Enable Syslog:** Place a check mark in the box provided to enable system logging.
- **Syslog Port Number:** This field is read-only and displays the port number (514) assigned for system logging.
- **Syslog Lowest Priority Logged:** The AP will send event messages to the Syslog server that correspond to the selected priority and above. For example, if set to 6, the AP will transmit event messages labeled priority 0 to 6 to the Syslog server(s).

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- **Syslog Host Table:** This table specifies the IP addresses of a network servers that the AP will send Syslog messages to. Click **Add** to create a new entry. Click **Edit** to change an existing entry. Each entry contains the following field:
  - — **IP Address:** Enter the IP Address for the management host.
  - — **Comment:** Enter an optional comment such as the host name.
  - — **Status:** The entry is enabled automatically when saved (so the Status field is only visible when editing an entry). You can also disable or delete entries by changing this field's value.

Bridge

The AP is a bridge between your wired and wireless networking devices. As a bridge, the functions performed by the AP include:

- MAC address learning
- Forward and filtering decision making
- Spanning Tree protocol used for loop avoidance

Once the AP is connected to your network, it learns which devices are connected to it and records their MAC addresses in the Learn Table. The table can hold up to 10,000 entries. To view the Learn Table, click on the **Monitor** button in the web interface and select the Learn Table tab.

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The **Bridge** tab has four sub-categories.

- Spanning Tree
- Storm Threshold
- Intra BSS
- Packet Forwarding

Spanning Tree

A Spanning Tree is used to avoid redundant communication loops in networks with multiple bridging devices. Bridges do not have any inherent mechanism to avoid loops, because having redundant systems is a necessity in certain networks. However, redundant systems can cause Broadcast Storms, multiple frame copies, and MAC address table instability problems.

Complex network structures can create multiple loops within a network. The Spanning Tree configuration blocks certain ports on AP devices to control the path of communication within the network, avoiding loops and following a spanning tree structure.

For more information on Spanning Tree protocol, please see Section 8.0 of the IEEE 802.1d standard. The Spanning Tree configuration options are advanced settings. Avaya recommends that you leave these parameters at their default values unless you are familiar with the Spanning Tree protocol.

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Storm Threshold

Storm Threshold is an advanced Bridge setup option that you can use to protect the network against data overload by:

- Specifying a maximum number of frames per second as received from a single network device (identified by its MAC address).
- Specifying an absolute maximum number of messages per port.

The Storm Threshold parameters allow you to specify a set of thresholds for each port of the AP, identifying separate values for the number of broadcast messages/second and Multicast messages/second.

When the number of frames for a port or identified station exceeds the maximum value per second, the AP will ignore all subsequent messages issued by the particular network device, or ignore all messages of that type.

- **Address Threshold:** Enter the maximum allowed number of packets per second.
- **Ethernet Threshold:** Enter the maximum allowed number of packets per second.
- **Wireless Threshold:** Enter the maximum allowed number of packets per second.

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Intra BSS

The wireless clients (or *subscribers*) that associate with a certain AP form the Basic Service Set (BSS) of a network infrastructure. By default, wireless subscribers in the same BSS can communicate with each other. However, some administrators (such as wireless public spaces) may wish to block traffic between wireless subscribers that are associated with the same AP to prevent unauthorized communication and to conserve bandwidth. This feature enables you to prevent wireless subscribers within a BSS from exchanging traffic.

Although this feature is generally enabled in public access environments, Enterprise LAN administrators use it to conserve wireless bandwidth by limiting communication between wireless clients. For example, this feature prevents peer-to-peer file sharing or gaming over the wireless network.

- To block Intra BSS traffic, set **Intra BSS Traffic Operation** to **Block**.
- To allow Intra BSS traffic, set **Intra BSS Traffic Operation** to **Passthru**.

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Packet Forwarding

The Packet Forwarding feature enables you to redirect traffic generated by wireless clients that are all associated to the same AP to a single MAC address. This filters wireless traffic without burdening the AP and provides additional security by limiting potential destinations or by routing the traffic directly to a firewall. You can redirect to a specific port (Ethernet or WDS) or allow the bridge's learning process (and the forwarding table entry for the selected MAC address) to determine the optimal port.

NOTE:
The gateway to which traffic will be redirected should be node on the Ethernet network. It should not be a wireless client.

Configuring Interfaces for Packet Forwarding

Configure your AP to forward packets by specifying interface port(s) to which packets are redirected and a destination MAC address.

1. Within the ***Packet Forwarding Configuration*** screen, check the box labeled **Enable Packet Forwarding**.
2. Specify a destination **Packet Forwarding MAC Address**. The AP will redirect all unicast, multicast, and broadcast packets received from wireless clients to the address you specify.
3. Select a **Packet Forwarding Interface Port** from the drop-down menu. You can redirect traffic to:

   — Ethernet

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— A WDS connection (see Wireless Distribution System (WDS) for details)

— Any (traffic is redirected to a port based on the bridge learning process)

4. Click **OK** to save your changes.

Security

The AP provides several security features to protect your network from unauthorized access.

- Authentication and Encryption Modes
- MAC Access

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Authentication and Encryption Modes

The AP supports the following Security features:

Type	Description
WEP Encryption	The original encryption technique specified by the IEEE 802.11 standard.
802.1x Authentication	An IEEE standard for client authentication.
Wi-Fi Protected Access (WPA)	A new standard that provides improved encryption security over WEP.

WEP Encryption

The IEEE 802.11 standards specify an optional encryption feature, known as Wired Equivalent Privacy or WEP, that is designed to provide a wireless LAN with a security level equal to what is found on a wired Ethernet network. WEP encrypts the data portion of each packet exchanged on an 802.11 network using an Encryption Key (also known as a WEP Key).

When Encryption is enabled, two 802.11 devices must have the same Encryption Keys and both devices must be configured to use Encryption in order to communicate. If one device is configured to use Encryption but a second device is not, then the two devices will not communicate, even if both devices have the same Encryption Keys.

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- An 802.11b AP supports 64-bit and 128-bit encryption:
  - — For 64-bit encryption, an encryption key is 10 hexadecimal characters (0-9 and A-F) or 5 ASCII characters (see ASCII Character Chart).
  - — For 128-bit encryption, an encryption key is 26 hexadecimal characters or 13 ASCII characters.
- An 802.11a or 802.11b/g AP supports 64-bit, 128-bit, and 152-bit encryption:
  - — For 64-bit encryption, an encryption key is 10 hexadecimal characters (0-9 and A-F) or 5 ASCII characters (see ASCII Character Chart).
  - — For 128-bit encryption, an encryption key is 26 hexadecimal characters or 13 ASCII characters.
  - — For 152-bit encryption, an encryption key is 32 hexadecimal characters or 16 ASCII characters.

NOTE:
64-bit encryption is sometimes referred to as 40-bit encryption; 128-bit encryption is sometimes referred to as 104-bit encryption.

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802.1x Authentication

IEEE 802.1x is a standard that provides a means to authenticate and authorize network devices attached to a LAN port. A port in the context of IEEE 802.1x is a point of attachment to the LAN, either a physical Ethernet connection or a wireless link to an Access Point. 802.1x requires a RADIUS server and uses the Extensible Authentication Protocol (EAP) as a standards-based authentication framework, and supports automatic key distribution for enhanced security. The EAP-based authentication framework can easily be upgraded to keep pace with future EAP types.

Popular EAP types include:

Type	Description
EAP-Message Digest 5 (MD5)	Username/Password-based authentication; does not support automatic key distribution
EAP-Transport Layer Security (TLS)	Certificate-based authentication (a certificate is required on the server and each client); supports automatic key distribution

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Type	Description
EAP-Tunneled Transport Layer Security (TTLS)	Certificate-based authentication (a certificate is required on the server; a client's username/password is tunneled to the server over a secure connection); supports automatic key distribution
PEAP - Protected EAP with MS-CHAP v2	Secure username/password-based authentication; supports automatic key distribution

Different servers support different EAP types and each EAP type provides different features. Refer to the documentation that came with your RADIUS server to determine which EAP types it supports.

NOTE:
The AP supports the following EAP types when Authentication Mode is set to **802.1x** or **WPA**: EAP-TLS, PEAP, and EAP-TTLS. When Authentication Mode is set to Mixed, the AP supports the following EAP types: EAP-TLS, PEAP, EAP-TLLS, and EAP-MD5 (MD5 does not support automatic key distribution; therefore, if you choose this method you need to manually configure each client with the network's encryption key).

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Authentication Process

There are three main components in the authentication process. The standard refers to them as:

1. supplicant (client PC)
2. authenticator (Access Point)
3. authentication server (RADIUS server)

When using Authentication Mode is set to 802.1x, WPA, or Mixed mode (802.1x and WEP), you need to configure your RADIUS server for authentication purposes.

Prior to successful authentication, an unauthenticated client PC cannot send any data traffic through the AP device to other systems on the LAN. The AP inhibits all data traffic from a particular client PC until the client PC is authenticated. Regardless of its authentication status, a client PC can always exchange 802.1x messages in the clear with the AP (the client begins encrypting data after it has been authenticated).

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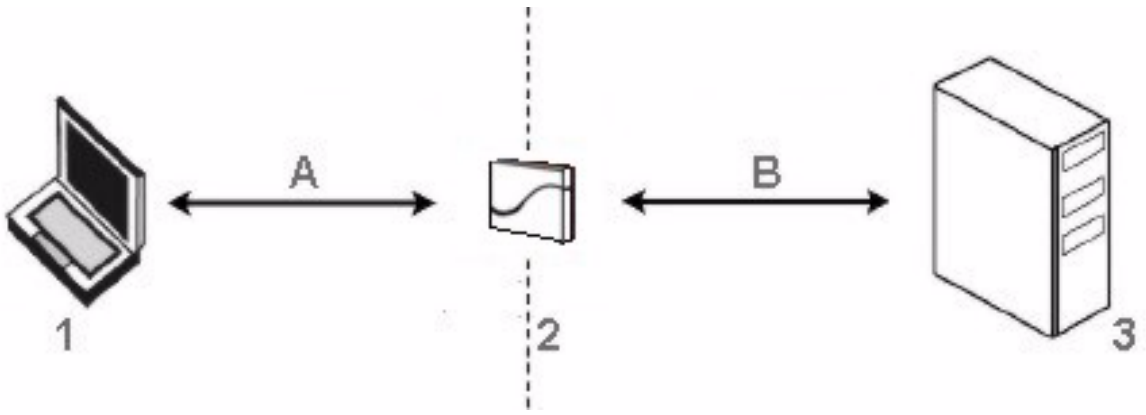
Figure 4-12. RADIUS Authentication Illustrated



The AP acts as a pass-through device to facilitate communications between the client PC and the RADIUS server. The AP (2) and the client (1) exchange 802.1x messages using an EAPOL (EAP Over LAN) protocol (A). Messages sent from the client station are encapsulated by the AP and transmitted to the RADIUS (3) server using EAP extensions (B).

Upon receiving a reply EAP packet from the RADIUS, the message is typically forwarded to the client, after translating it back to the EAPOL format. Negotiations take place between the client and the RADIUS server. After the client has been successfully authenticated, the client receives an Encryption Key from the AP (if the EAP type supports automatic key distribution). The client uses this key to encrypt data after it has been authenticated.

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For 802.11a and 802.11b/g clients that communicate with an AP, each client receives its own unique encryption key; this is known as Per User Per Session Encryption Keys.

Wi-Fi Protected Access (WPA)

Wi-Fi Protected Access (WPA) is a security standard designed by the Wi-Fi Alliance in conjunction with the Institute of Electrical and Electronics Engineers (IEEE). WPA is a sub-set of the forthcoming IEEE 802.11i security standard, currently in draft form. (IEEE 802.11i is also referred to as "WPA2" and will be available in 2004.)

NOTE:
For Dual-radio APs: WPA is available for APs with an 11a Upgrade Kit or 802.11b/g Kit. WPA is NOT available for APs with an 802.11b PC Card or a 5 GHz Upgrade Kit.

WPA is a replacement for Wired Equivalent Privacy (WEP), the encryption technique specified by the original 802.11 standard. WEP has several vulnerabilities that have been widely publicized. WPA addresses these weaknesses and provides a stronger security system to protect wireless networks.

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WPA provides the following new security measures not available with WEP:

- Improved packet encryption using the Temporal Key Integrity Protocol (TKIP) and the Michael Message Integrity Check (MIC).
- Per-user, per-session dynamic encryption keys:
  - — Each client uses a different key to encrypt and decrypt unicast packets exchanged with the AP
  - — A client's key is different for every session; it changes each time the client associates with an AP
  - — The AP uses a single global key to encrypt broadcast packets that are sent to all clients simultaneously
  - — Encryption keys change periodically based on the **Re-keying Interval** parameter
  - — WPA uses 128-bit encryption keys
- Dynamic Key distribution
  - — The AP generates and maintains the keys for its clients
  - — The AP securely delivers the appropriate keys to its clients
- Client/server mutual authentication
  - — 802.1x
  - — Pre-shared key (for networks that do not have an 802.1x solution implemented)

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NOTE:
For more information on WPA, see the Wi-Fi Alliance Web site at http://www.wi-fi.org.

The AP supports two WPA authentication modes:

- **WPA:** The AP uses 802.1x to authenticate clients. You should only use an EAP that supports mutual authentication and session key generation, such as EAP-TLS, EAP-TTLS, and PEAP. See 802.1x Authentication for details.
- **WPA-PSK (Pre-Shared Key):** For networks that do not have 802.1x implemented, you can configure the AP to authenticate clients based on a Pre-Shared Key. This is a shared secret that is manually configured on the AP and each of its clients. The Pre-Shared Key must be 256 bits long, which is either 64 hexadecimal digits or 32 alphanumeric characters (see ASCII Character Chart). The AP also supports a **PSK Pass Phrase** option to facilitate the creation of the Pre-Shared Key (so a user can enter an easy-to-remember phrase rather than a string of characters).

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Configuring Security Settings

You can configure each wireless interface to operate in one of the following Security modes:

Security Mode	Description
No Security	This is the default setting for an AP.
Enable WEP Encryption	The AP and clients use the same static WEP keys to encrypt data.
Enable 802.1x Security	The AP uses the 802.1x standard to communicate with a RADIUS server and authenticate clients. The AP generates and distributes dynamic, per user WEP Keys to each client following successful authentication.
Enable Mixed Mode (802.1x and WEP Encryption)	The AP uses 802.1x Mode for clients that support 802.1x (and have an 802.1x supplicant application installed). The AP uses static WEP Encryption for clients that do not use 802.1x.

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Security Mode	Description
Enable WPA Mode	The AP uses 802.1x to communicate with a RADIUS server and authenticate clients. The AP generates and distributes dynamic, per user encryption keys (based on the Temporal Key Integrity Protocol (TKIP)) to each client following successful authentication. WPA mode provides message integrity checking to guard against replay type attacks. This mode is not available for all radio types.
Enable WPA-PSK Mode	The AP uses a Pre-shared Key (manually configured on both the AP and the clients) to authenticate clients. The AP generates and distributes dynamic, per user encryption keys (based on TKIP) to each client following successful authentication. This mode is for customers who want to use WPA but do not have a RADIUS server installed on their network. This mode is not available for all radio types.

You configure the AP to use a particular Security mode by setting the Authentication Mode parameter. The following table summarizes the Authentication Mode options available in the HTTP Interface's **Configure** > **Security** > **Authentication** screen and describes how each of these options correspond to the six Security Modes listed above:

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Authentication Mode Setting	**Authentication Method Employed**	**Encryption Method Employed**
None	None	None or manually configured Static WEP settings (from **Configure** > **Security** > **Encryption** screen)
802.1x	802.1x	Dynamic WEP Keying
Mixed	802.1x or None (depends on a client's configuration)	Dynamic WEP Keying or Static WEP (depends on client's configuration)
WPA	802.1x	Dynamic TKIP Keying
WPA-PSK	Manually configured Pre-shared Key	Dynamic TKIP Keying

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Enable WEP Encryption

Follow these steps to set up WEP encryption on an AP:

1. Place a check mark in the box labeled **Enable Encryption (WEP)**.
2. Enter one to four Encryption Keys in the fields provided. Keep in mind the following:
   - — If entering more than one Key, use the same number of characters for each Key. All Keys need to be the same Key Size (64, 128, or 152-bit).
   - — You can enter the Encryption Keys in either hexadecimal or ASCII format.
   - — You need to configure your wireless clients to use the same Keys in order for the clients and the AP to communicate.
3. Select the Key that the AP will use to encryption outgoing data from the **Encrypt Data Transmissions Using** drop-down menu. By default, this parameter is set to Key 1.
4. Click **OK**.

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Enable 802.1x Security

Follow these steps to enable 802.1x only:

1. Within the ***802.1x Configuration*** screen, set **802.1x Security Mode** to **802.1x**.
2. Select an **Encryption Key Length**.
   - — An 802.11b AP supports 64-bit and 128-bit encryption.
   - — An 802.11a or 802.11b/g AP supports 64-bit and 128-bit encryption.
3. Enter a **Re-keying Interval**.
   - — The Re-keying Interval determines how often a client's encryption key is changed and can be set to any value between 60 - 65535 seconds. Rekeying frustrates hacking attempts without taxing system resources. Setting a fairly frequent rekey value (900 seconds=15 minutes) effectively protects against intrusion without disrupting network activities.
4. Click **OK** to save the changes.
5. If you have not already done so, configure the RADIUS authentication settings (see RADIUS Authentication with 802.1x for details.
6. Reboot the Access Point.

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Enable Mixed Mode (802.1x and WEP Encryption)

Follow these steps to use both 802.1x and WEP Encryption simultaneously (clients that do not support 802.1x use WEP Encryption for security purposes):

1. Within the ***802.1x Configuration*** screen, set **802.1x Security Mode** to **Mixed**.
2. Enter a **Re-keying Interval**.
   - The Re-keying Interval determines how often a client's encryption key is changed and can be set to any value between 60 - 65535 seconds. Rekeying frustrates hacking attempts without taxing system resources. Setting a fairly frequent rekey value (900 seconds=15 minutes) effectively protects against intrusion without disrupting network activities.
3. Click **OK** to save the changes.
4. Click the **Encryption** tab.
5. Place a check mark in the box labeled **Enable Encryption (WEP)**.
6. Configure **Encryption Key 1** only (i.e., do not configure Keys 2 through 4). Keep in mind the following:
   - For 64-bit encryption, an encryption key is 10 hexadecimal characters (0-9 and A-F) or 5 ASCII characters (see ASCII Character Chart).
   - For 128-bit encryption, an encryption key is 26 hexadecimal characters or 13 ASCII characters.

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— You can enter the Encryption Keys in either hexadecimal or ASCII format.

— You need to manually configure your wireless clients that do not support 802.1x to use the same Encryption Key.

7. Confirm that **Key 1** is selected in the **Encrypt Data Transmissions Using** drop-down menu.
8. Click **OK**.
9. If you have not already done so, configure the RADIUS authentication settings (see RADIUS Authentication with 802.1x for details).
10. Reboot the Access Point.

802.1x Security and Wireless Distribution Systems (WDS)

Wireless distribution systems (WDS) are configured using specific ports on an 802.11b AP. To use 802.1x with WDS, you need to set the 802.1x Security Mode to Mixed (WEP and 802.1x) and confirm that the 802.11b APs communicating in the WDS share the same encryption key (Key 1). See Wireless Distribution System (WDS) for more information.

NOTE:
An 802.11a or 802.11b/g AP does not support WDS.

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Enable WPA Mode

NOTE:
For Dual-radio APs: WPA is available for APs with an 11a Upgrade Kit or 802.11b/g Kit. WPA is NOT available for APs with an 802.11b PC Card or a 5 GHz Upgrade Kit.

1. Click **Configure** > **Security** > **Authentication**.
2. Set **Authentication Mode** to **WPA**.
3. Enter a **Re-keying Interval**.
   — The Re-keying Interval determines how often a client's encryption key is changed and can be set to any value between 60 and 65535 seconds. Rekeying frustrates hacking attempts without taxing system resources. Setting a fairly frequent rekey value (900 seconds=15 minutes) effectively protects against intrusion without disrupting network activities.
4. Click **OK**.
5. If you have not already done so, configure the RADIUS authentication settings.
6. Reboot the Access Point.

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Enable WPA-PSK Mode

NOTE:
For Dual-radio APs: WPA is available for APs with an 11a Upgrade Kit or 802.11b/g Kit. WPA is NOT available for APs with an 802.11b PC Card or a 5 GHz Upgrade Kit.

1. Click **Configure** > **Security** > **Authentication**.
2. Set **Authentication Mode** to **WPA-PSK**.
3. Enter a **Re-keying Interval**.
   — The Re-keying Interval determines how often a client's encryption key is changed and can be set to any value between 60 and 65535 seconds. Rekeying frustrates hacking attempts without taxing system resources. Setting a fairly frequent rekey value (900 seconds=15 minutes) effectively protects against intrusion without disrupting network activities.

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4. Configure the Pre-Shared Key.

   — You must also configure your clients to use this same key.

   — Do one of the following:

   - Enter 64 hexadecimal digits or 32 ASCII characters in the Pre-Shared Key field. See ASCII Character Chart for a hexadecimal to ASCII conversion chart.
   - Enter a phrase in the PSK Pass Phrase field. The AP will automatically generate a Pre-Shared Key based on the phrase you enter. Enter between 1 and 64 characters; Avaya recommends using a pass phrase of at least 13 characters to ensure that the generated key cannot be easily deciphered by network infiltrators.

5. Click **OK**.

6. Reboot the Access Point.

MAC Access

The MAC Access tab allows you to build a list of stations, identified by their MAC addresses, authorized to access the network through the AP. The list is stored inside each AP within your network. Note that you must reboot the AP for any changes to the MAC Access Control Table to take effect.

- **Enable MAC Access Control:** Check this box to enable the Control Table.
- **Operation Type:** Choose between **Passthru** and **Block**. This

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determines how the stations identified in the MAC Access Control Table are filtered.

— If set to **Passthru**, only the addresses listed in the Control Table will pass through the bridge.

— If set to **Block**, the bridge will block traffic to or from the addresses listed in the Control Table.

- **MAC Access Control Table:** Click **Add** to create a new entry. Click **Edit** to change an existing entry. Each entry contains the following field:

  — **MAC Address:** Enter the wireless client's MAC address.

  — **Comment:** Enter an optional comment such as the client's name.

- **Status:** The entry is enabled automatically when saved (so the Status field is only visible when editing an entry). You can also disable or delete entries by changing this field's value.

NOTE:
For larger networks that include multiple Access Points, you may prefer to maintain this list on a centralized location using the MAC Access Control Via RADIUS Authentication.

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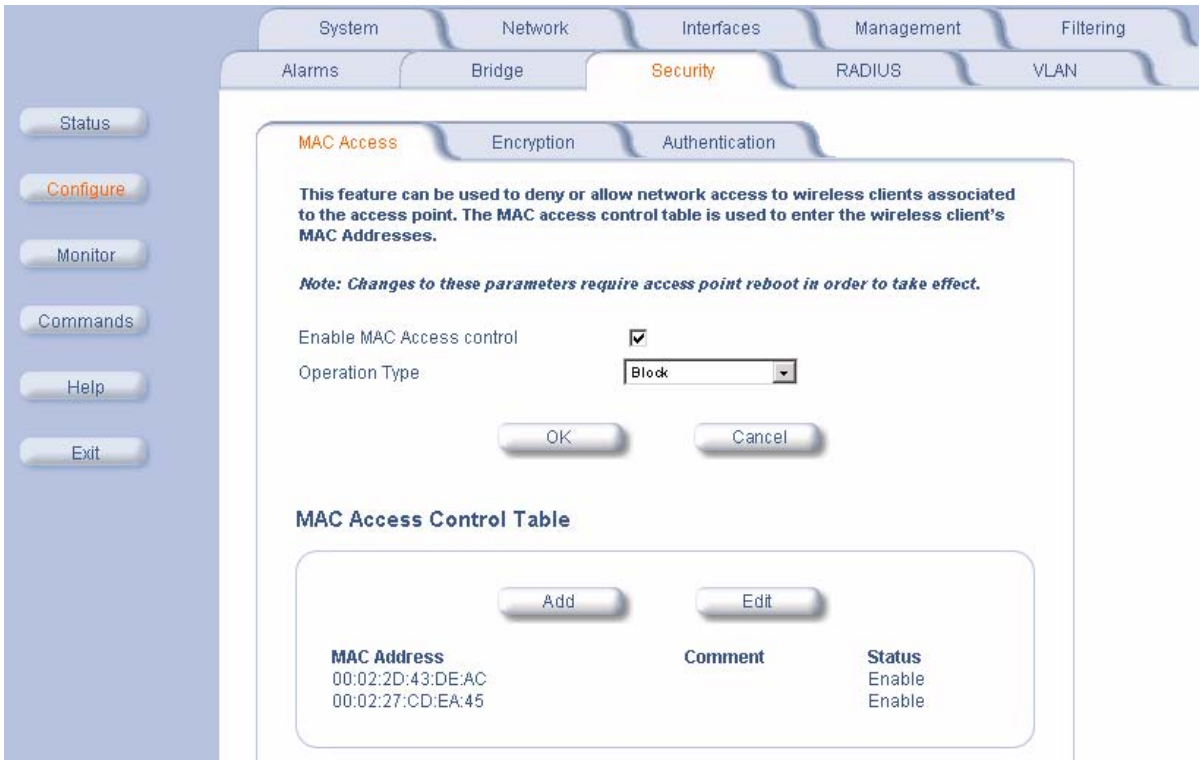
Figure 4-13. MAC Access Configuration Screen



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RADIUS

The AP communicates with a network's RADIUS server to provide the following features:

- MAC Access Control Via RADIUS Authentication
- RADIUS Authentication with 802.1x
- RADIUS Accounting

You can configure the AP to communicate with up to four different RADIUS servers:

- Primary Authentication Server
- Back-up Authentication Server
- Primary Accounting Server
- Back-up Accounting Server

NOTE:
You must have configured the settings for at least one Authentication server before configuring the settings for an Accounting server.

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The back-up servers are optional, but when configured, the AP will communicate with the back-up server if the primary server is off-line. After the AP has switched to the backup server, it will periodically check the status of the primary RADIUS server every five (5) minutes. Once the primary RADIUS server is again online, the AP automatically reverts from the backup RADIUS server back to the primary RADIUS server. All subsequent requests are then sent to the primary RADIUS server.

MAC Access Control Via RADIUS Authentication

If you want to control wireless access to the network and if your network includes a RADIUS Server, you can store the list of MAC addresses on the RADIUS server rather than configure each AP individually. From the RADIUS Authentication tab, you can define the IP Address of the server that contains a central list of MAC Address values that identify the authorized stations that may access the wireless network. You must specify information for at least the primary RADIUS server. The back-up RADIUS server is optional.

NOTE:
Contact your RADIUS server manufacturer if you have problems configuring the server or have problems using RADIUS authentication.

Follow these steps to enable RADIUS MAC Access Control:

1. Within the ***RADIUS Access Control Configuration*** screen, place a check mark in the box labeled **Enable RADIUS MAC Access Control**.

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2. Place a check mark in the box labeled **Enable Primary RADIUS Authentication Server**.
3. If you want to configure a back-up RADIUS server, place a check mark in the box labeled **Enable Back-up RADIUS Authentication Server**.
4. Enter the time, in seconds, each client session may be active before being automatically re-authenticated in the **Authorization Lifetime** field. This parameter supports a value between 900 and 43200 sec; the default is 900 sec.
5. Select a **MAC Address Format Type**. This should correspond to the format in which the clients' 12-digit MAC addresses are listed within the RADIUS server. Available options include:
   - **Dash delimited:** dash between each pair of digits: xx-yy-zz-aa-bb-cc
   - **Colon delimited:** colon between each pair of digits: xx:yy:zz:aa:bb:cc)
   - **Single dash delimited:** dash between the sixth and seventh digits: xxyyzz-aabbcc
   - **No delimiters:** No characters or spaces between pairs of hexadecimal digits: xxyyzzaabbcc
6. Select a **Server Addressing Format** type (IP Address or Name).
   - If you want to identify RADIUS servers by name, you must configure the AP as a DNS Client. See DNS Client for details.
7. Enter the server's IP address or name in the field provided.

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8. Enter the port number which the AP and the server will use to communicate. By default, RADIUS servers communicate on port 1812.
9. Enter the Shared Secret in the **Shared Secret** and **Confirm Shared Secret** field. This is a password shared by the RADIUS server and the AP. The same password must also be configured on the RADIUS server.
10. Enter the maximum time, in seconds, that the AP should wait for the RADIUS server to respond to a request in the **Response Time** field. Range is 1-10 seconds; default is 3 seconds.
11. Enter the maximum number of times an authentication request may be retransmitted in the **Maximum Retransmissions** field. Range is 1-4; default is 3.
12. If you are configuring a back-up server, repeat Steps 6 through 11 for the back-up server.
13. Click **OK** to save your changes.
14. Reboot the AP for these changes to take effect.

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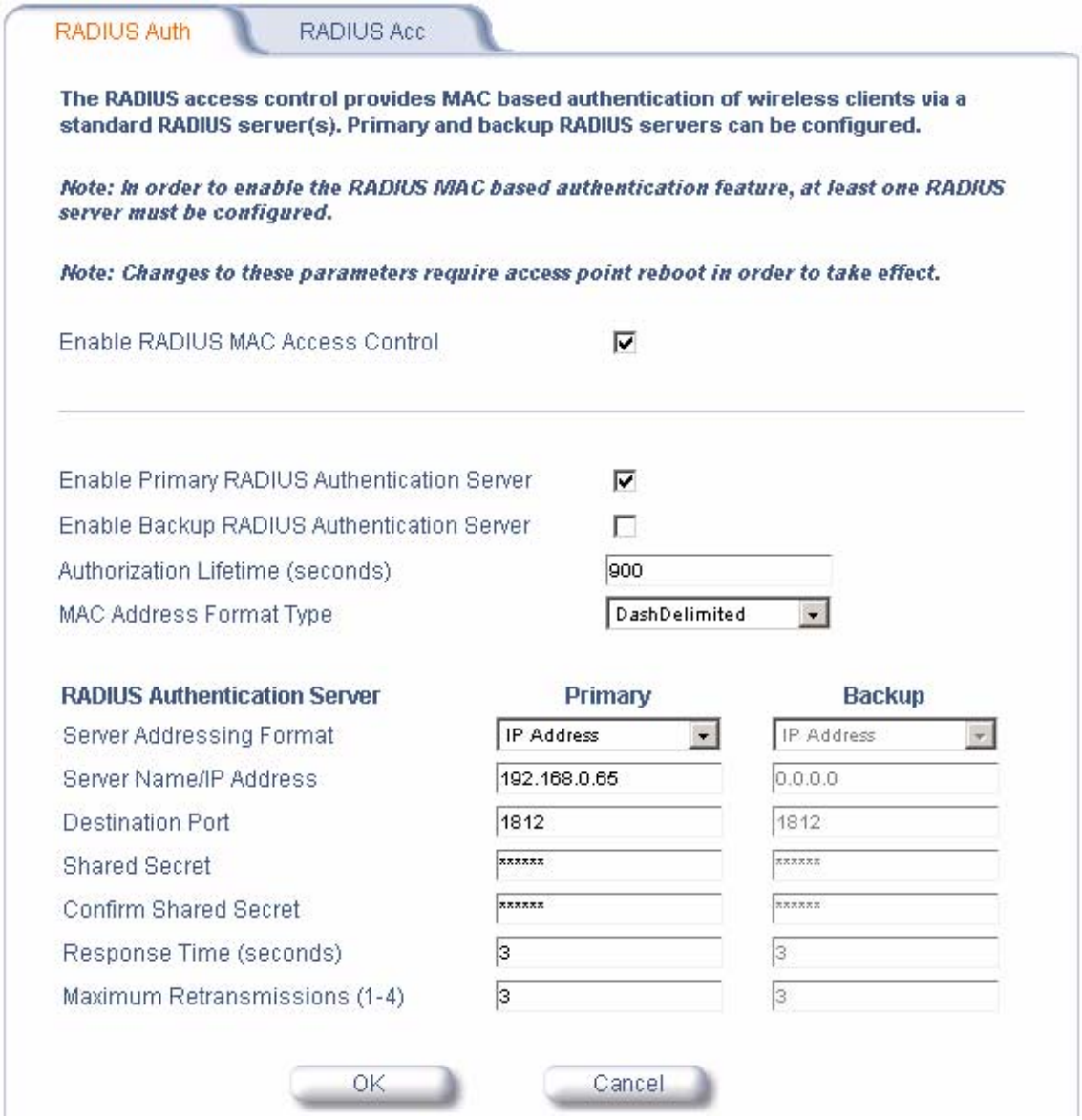
Figure 4-14. RADIUS Access Control Configuration Screen



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RADIUS Authentication with 802.1x

You must configure a primary RADIUS Authentication server to use 802.1x security. A back-up server is optional.

NOTE:
Problems with RADIUS Server configuration or RADIUS Authentication should be referred to the RADIUS Server developer.

Follow these steps to enable a RADIUS Authentication server for 802.1x security:

1. Within the ***802.1x Configuration*** screen, configure the 802.1x settings. See 802.1x Authentication for details.
2. Click the **RADIUS** tab.
3. Click the **RADIUS Auth** sub-tab.
4. Place a check mark in the box labeled **Enable Primary RADIUS Authentication Server**.
5. If you want to configure a back-up RADIUS server, place a check mark in the box labeled **Enable Back-up RADIUS Authentication Server**.
6. Enter the time, in seconds, each client session may be active before being automatically re-authenticated in the **Authorization Lifetime** field. This parameter supports a value between 900 and 43200 sec; the default is 900 sec.
7. Select a **Server Addressing Format** type (IP Address or Name).

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— If you want to identify RADIUS servers by name, you must configure the AP as a DNS Client. See DNS Client for details.

8. Enter the server's IP address or name in the field provided.
9. Enter the port number which the AP and the server will use to communicate. By default, RADIUS servers communicate on port 1812.
10. Enter the Shared Secret in the **Shared Secret** and **Confirm Shared Secret** field. This is a password shared by the RADIUS server and the AP. The same password must also be configured on the RADIUS server.
11. Enter the maximum time, in seconds, that the AP should wait for the RADIUS server to respond to a request in the **Response Time** field. Range is 1-10 seconds; default is 3 seconds.
12. Enter the maximum number of times an authentication request may be retransmitted in the **Maximum Retransmissions** field. Range is 1-4; default is 3.
13. If you are configuring a back-up server, repeat Steps 7 through 12 for the back-up server.
14. Click **OK** to save your changes.
15. Reboot the AP device for these changes to take effect.

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RADIUS Accounting

Using an external RADIUS server, the AP can track and record the length of client sessions on the access point by sending RADIUS accounting messages per RFC2866. When a wireless client is successfully authenticated, RADIUS accounting is initiated by sending an “Accounting Start” request to the RADIUS server. When the wireless client session ends, an “Accounting Stop” request is sent to the RADIUS server.

Session Length

Accounting sessions continue when a client reauthenticates to the same AP. Sessions are terminated when:

- A client disassociates.
- A client does not transmit any data to the AP for a fixed amount of time.
- A client is detected on a different interface.

If the client roams from one AP to another, one session is terminated and a new session is begun.

NOTE:
This feature requires RADIUS authentication using MAC Access Control or 802.1x. Wireless clients configured in the Access Point’s static MAC Access Control list are not tracked.

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Configuring RADIUS Accounting

Follow these steps to enable RADIUS accounting on the AP:

1. Within the ***RADIUS Accounting Configuration*** screen, place a check mark in the **Enable RADIUS Accounting** box to turn on this feature.
2. Place a check mark in the box labeled **Enable Primary RADIUS Accounting Server**.
3. If you want to configure a back-up RADIUS server, place a check mark in the box labeled **Enable Back-up RADIUS Accounting Server**.
4. Enter the session timeout interval in minutes within the **Accounting Inactivity Timer** field. An accounting session automatically ends for a client that is idle for the period of time specified. Range is 1-60 minutes; default is 5 minutes.
5. Select a **Server Addressing Format** type (IP Address or Name).
   — If you want to identify RADIUS servers by name, you must configure the Access Point as a DNS Client. See DNS Client for details.
6. Enter the server's IP address or name in the field provided.
7. Enter the port number which the AP and the server will use to communicate. By default, RADIUS accounting uses port 1813.

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8. Enter the Shared Secret in the **Shared Secret** and **Confirm Shared Secret** field. This is a password shared by the RADIUS server and the AP. The same password must also be configured on the RADIUS server.
9. Enter the maximum time, in seconds, that the AP should wait for the RADIUS server to respond to a request in the **Response Time** field. Range is 1-10 seconds; default is 3 seconds.
10. Enter the maximum number of times an authentication request may be retransmitted in the **Maximum Retransmissions** field. Range is 1-4; default is 3.
11. If you are configuring a back-up server, repeat Steps 5 through 10 for the back-up server.
12. Click **OK** to save your changes.
13. Reboot the AP device for these changes to take effect.

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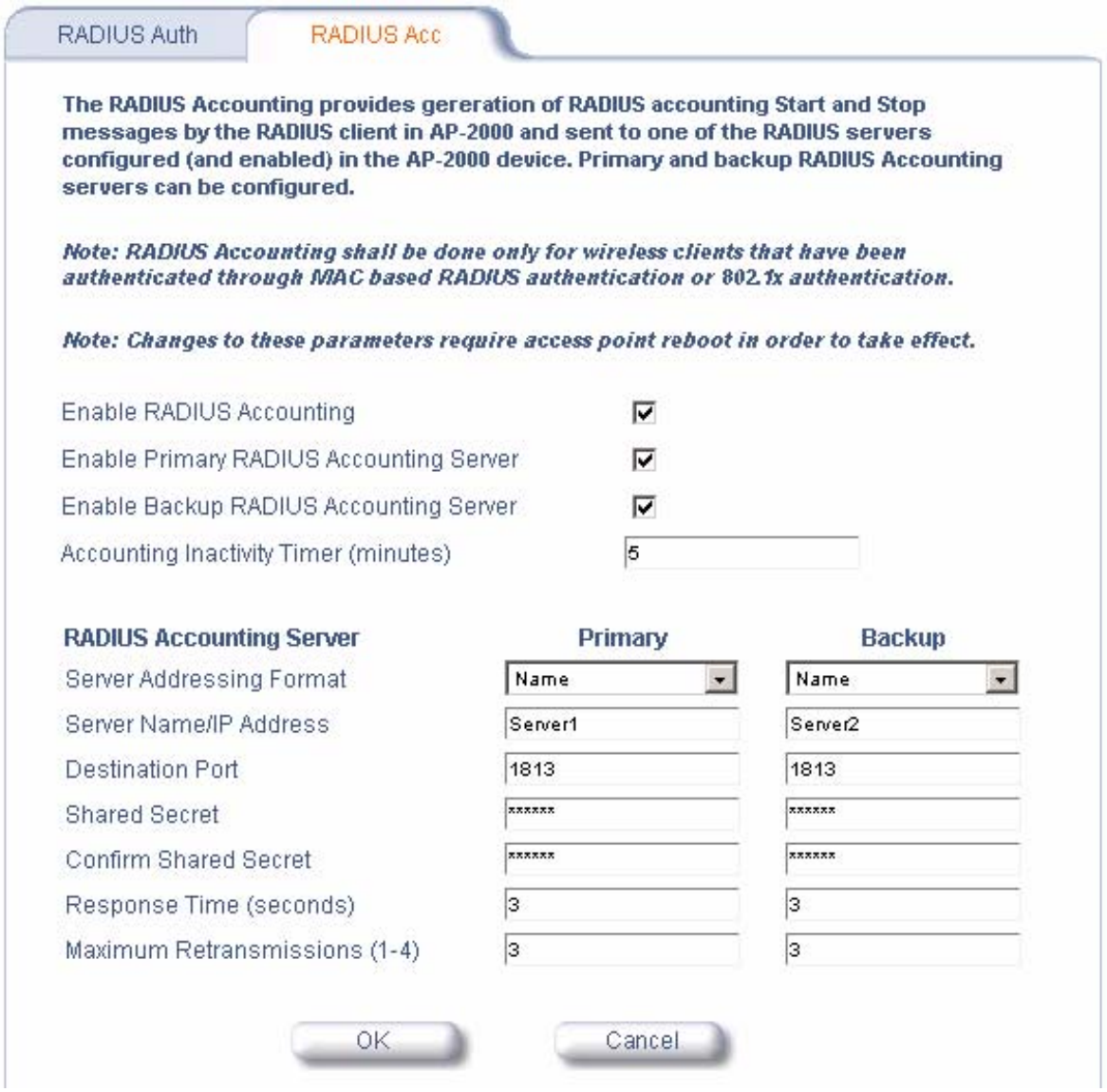
Figure 4-15. RADIUS Accounting Server Configuration


RADIUS Auth
RADIUS Acc
The RADIUS Accounting provides gereration of RADIUS accounting Start and Stop messages by the RADIUS client in AP-2000 and sent to one of the RADIUS servers configured (and enabled) in the AP-2000 device. Primary and backup RADIUS Accounting servers can be configured.
Note: RADIUS Accounting shall be done only for wireless clients that have been authenticated through MAC based RADIUS authentication or 802.1x authentication.
Note: Changes to these parameters require access point reboot in order to take effect.
Enable RADIUS Accounting
Enable Primary RADIUS Accounting Server
Enable Backup RADIUS Accounting Server
Accounting Inactivity Timer (minutes)
5
RADIUS Accounting Server
Primary
Backup
Server Addressing Format
Name
Name
Server Name/IP Address
Server1
Server2
Destination Port
1813
1813
Shared Secret
Confirm Shared Secret
Response Time (seconds)
3
3
Maximum Retransmissions (1-4)
3
3
OK
Cancel

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VLAN/SSID

The AP allows you to segment wireless networks into multiple sub-networks based on Network Name (SSID) and VLAN membership.

A Network Name (SSID) identifies a wireless network. Clients associate with Access Points that share its SSID. During installation, the Setup Wizard prompts you to configure one Network Name for each wireless interface. After initial setup, the AP can be configured to support up to 16 SSIDs per wireless interface to segment wireless networks based on VLAN membership.

NOTE:
For Dual-radio APs: APs with an 11a Upgrade Kit or 802.11b/g Kit support up to 16 VLAN/SSID pairs. APs with an 802.11b PC Card or a 5 GHz Upgrade Kit support only one VLAN/SSID per radio.

VLAN Overview

Virtual Local Area Networks (VLANs) are logical groupings of network hosts. Defined by software settings, other VLAN members or resources appear (to clients) to be on the same physical segment, no matter where they are attached on the logical LAN or WAN segment. They simplify traffic flow between clients and their frequently-used or restricted resources.

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VLANs now extend as far as the reach of the access point signal. Clients can be segmented into wireless sub-networks via SSID and VLAN assignment. A Client can access the network by connecting to an AP configured to support its assigned SSID/VLAN.

AP devices are fully VLAN-ready; however, by default VLAN support is disabled. Before enabling VLAN support, certain network settings should be configured, and network resources such as a VLAN-aware switch, a RADIUS server, and possibly a DHCP server should be available.

Once enabled, VLANs are used to conveniently, efficiently, and easily manage your network in the following ways:

- Manage adds, moves, and changes from a single point of contact
- Define and monitor groups
- Reduce broadcast and multicast traffic to unnecessary destinations
  - — Improve network performance and reduce latency
- Increase security
  - — Secure network restricts members to resources on their own VLAN
  - — Clients roam without compromising security

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VLAN tagged data is collected and distributed through an AP's wireless interface(s) based on Network Name (SSID). An Ethernet port on the access point connects a wireless cell or network to a wired backbone. The access points communicate across a VLAN-capable switch that analyzes VLAN-tagged packet headers and directs traffic to the appropriate ports. On the wired network, a RADIUS server authenticates traffic and a DHCP server manages IP addresses for the VLAN(s). Resources like servers and printers may be present, and a hub may include multiple APs, extending the network over a larger area.

In this figure, the numbered items correspond to the following components:

1. VLAN-enabled access point
2. VLAN-aware switch (IEEE 802.1Q uplink)
3. AP management via wired host (SNMP, Web interface or CLI)
4. DHCP Server
5. RADIUS Server
6. VLAN 1
7. VLAN 2

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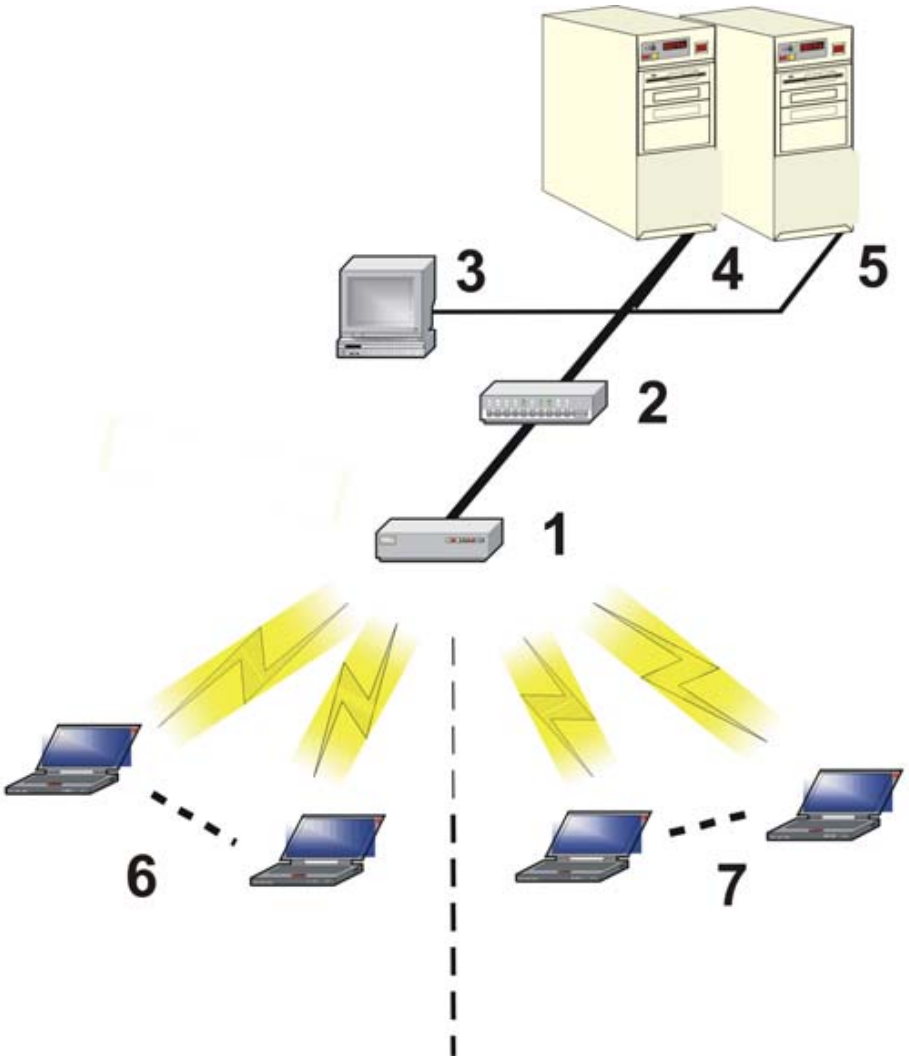
Figure 4-16. Components of a typical VLAN



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VLAN Workgroups and Traffic Management

Access Points that are not VLAN-capable typically transmit broadcast and multicast traffic to all wireless Network Interface Cards (NICs). This process wastes wireless bandwidth and degrades throughput performance. In comparison, VLAN-capable AP is designed to efficiently manage delivery of broadcast, multicast, and unicast traffic to wireless clients.

The AP assigns clients to a VLAN based on a Network Name (SSID). The AP can support up to 16 VLAN/SSID pairs per radio. (Note that 802.11b APs (Single or Dual-radio models) and 5 GHz Upgrade Kits (for Dual-radio APs) can only support one VLAN/SSID per radio.)

The AP matches packets transmitted or received to a network name with the associated VLAN. Traffic received by a VLAN is only sent on the wireless interface associated with that same VLAN. This eliminates unnecessary traffic on the wireless LAN, conserving bandwidth and maximizing throughput.

Traffic Management

In addition to enhancing wireless traffic management, the VLAN-capable AP supports easy assignment of wireless users to workgroups. In a typical scenario, each user VLAN represents a workgroup; for example, one VLAN could be used for an EMPLOYEE workgroup and the other, for a GUEST workgroup.

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In this scenario, the AP would assign every packet it accepted to a VLAN. Each packet would then be identified as EMPLOYEE or GUEST, depending on which wireless NIC received it. The AP would insert VLAN headers or “tags” with identifiers into the packets transmitted on the wired backbone to a network switch.

Finally, the switch would be configured to route packets from the EMPLOYEE workgroup to the appropriate corporate resources such as printers and servers. Packets from the GUEST workgroup could be restricted to a gateway that allowed access to only the Internet. A member of the GUEST workgroup could send and receive e-mail and access the Internet, but would be prevented from accessing servers or hosts on the local corporate network.

Typical User VLAN Configurations

VLANs segment network traffic into workgroups, which enable you to limit broadcast and multicast traffic. Workgroups enable clients from different VLANs to access different resources using the same network infrastructure. Clients using the same physical network are limited to those resources available to their workgroup.

The AP can segment users into a maximum of 16 different workgroups (32 if using two cards in a Dual-radio AP) based on an SSID/VLAN pair (also referred as a VLAN Workgroup or a Sub-network).

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NOTE:
For Dual-radio APs: APs with an 11a Upgrade Kit or 802.11b/g Kit support up to 16 VLAN/SSID pairs. APs with an 802.11b PC Card or a 5 GHz Upgrade Kit support only one VLAN/SSID per radio.

The four primary scenarios for using VLAN workgroups are as follows:

VLAN disabled: Your network does not use VLANs, but you can configure the AP to use multiple SSIDs.
VLAN enabled, all VLAN Workgroups use the same VLAN ID Tag
VLAN enabled, each VLAN workgroup uses a different VLAN ID Tag
VLAN enabled, a mixture of Tagged and Untagged workgroups

Configure Multiple VLAN/SSID Pairs

NOTE:
You must reboot the AP before any changes to these parameters take effect.

1. Click **Configure** > **VLAN**.
2. Place a check mark in the **Enable VLAN Protocol** box to enable VLAN support.
3. Click the tab for Wireless A or Wireless B (if applicable).

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4. Add one or more new SSID/VLAN entries. Follow these steps:

NOTE:
For Dual-radio APs: APs with an 11a Upgrade Kit or 802.11b/g Kit support up to 16 VLAN/SSID pairs. APs with an 802.11b PC Card or a 5 GHz Upgrade Kit support only one VLAN/SSID per radio.

a. Click **Add** to create a new SSID/VLAN entry.

b. Enter a **Network Name (SSID)**, between 1 and 32 characters, in the field provided.

c. Enter a **VLAN ID** in the field provided.

- As defined by the 802.1Q standard, a VLAN ID is a number between 1 and 4094. A value of -1 means that an entry is "untagged".
- You can use the same VLAN ID for all SSIDs if you want all wireless clients to be part of the same VLAN.
- You can specify a different VLAN ID for each SSID.
- The VLAN ID must match an ID used by your network; contact your network administrator if you need assistance defining the VLAN IDs.
- You can set the VLAN ID to "-1" or "untagged" if you do not want clients that are using a specific SSID to be members of a VLAN workgroup.

d. Click **OK**.

e. Click the back arrow button to return to the previous screen.

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— Click **Edit** if you want to modify an existing entry. You can also disable or delete an entry from the ***Edit*** screen.

5. Click the tab for the second wireless interface (if applicable) and create/modify SSID/VLAN entries as necessary.
6. Reboot the AP.

Typical VLAN Management Configurations

Control Access to the AP

Management access to the AP can easily be secured by making management stations or hosts and the AP itself members of a common VLAN. Simply configure a non-zero management VLAN ID and enable VLAN to restrict management of the AP to members of the same VLAN.

NOTE:
If a non-zero management VLAN ID is configured then management access to the AP is restricted to wired or wireless hosts that are members of the same VLAN. Ensure your management platform or host is a member of the same VLAN before attempting to manage the AP.

1. Click **Configure** > **VLAN**.
2. Set the **VLAN Management ID** to a value between 0 and 4094 (a value of 0 disables VLAN management).
3. Place a check mark in the **Enable VLAN Protocol** box.

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Provide Access to a Wireless Host in the Same Workgroup

The VLAN feature can allow wireless clients to manage the AP. If the VLAN Management ID matches a VLAN User ID, then those wireless clients who are members of that VLAN will have AP management access.

⚠ CAUTION:

Once a VLAN Management ID is configured and is equivalent to one of the VLAN User IDs on the AP, all members of that User VLAN will have management access to the AP. Be careful to restrict VLAN membership to those with legitimate access to the AP.

1. Click **Configure** > **VLAN**.
2. Set the **VLAN Management ID** to use the same VLAN ID as one of the configured SSID/VLAN pairs. See Typical User VLAN Configurations for details.
3. Place a check mark in the **Enable VLAN Protocol** box.

Disable VLAN Management

1. Click **Configure** > **VLAN**.
2. Remove the check mark from the **Enable VLAN Protocol** box (to disable all VLAN functionality) or set the **VLAN Management ID** to 0 (to disable VLAN Management only).

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Monitor Information 5

In This Chapter

- Logging into the HTTP Interface
- Version: Provides version information for the Access Point's system components.
- ICMP: Displays statistics for Internet Control Message Protocol packets sent and received by the AP.
- IP/ARP Table: Displays the AP's IP Address Resolution table.
- Learn Table: Displays the list of nodes that the AP has learned are on the network.
- IAPP: Provides statistics for the Inter-Access Point Protocol messages sent and received by the AP.
- RADIUS: Provides statistics for the configured primary and backup RADIUS server(s).
- Interfaces: Displays the Access Point's interface statistics (Wireless and Ethernet).
- Link Test (802.11b APs Only): Evaluates the link with a wireless client.

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Logging into the HTTP Interface

Once the AP has a valid IP Address and an Ethernet connection, you may use your web browser to monitor network statistics.

The Command Line Interface (CLI) also provides a method for viewing network statistics using Telnet or a serial connection. This section covers only use of the HTTP interface. For more information about viewing network statistics with the CLI, refer to Command Line Interface (CLI).

Follow these steps to monitor an AP's operating statistics using the HTTP interface:

1. Open a Web browser on a network computer.

NOTE:
The HTTP interface supports the following Web browser:

— Microsoft Internet Explorer 6 with Service Pack 1 or later

— Netscape 6.1 or later

2. If necessary, disable the Internet proxy settings. For Internet Explorer users, follow these steps:

— Select **Tools > Internet Options...**.

— Click the **Connections** tab.

— Click **LAN Settings...**.

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— If necessary, remove the check mark from the **Use a proxy server** box.

— Click **OK** twice to save your changes and return to Internet Explorer.

3. Enter the Access Point's IP address in the browser's **Address** field and press **Enter**.

   — **Result:** The AP ***Enter Network Password*** screen appears.

4. Enter the HTTP password in the **Password** field and click **OK**. Leave the **User Name** field blank. (By default, the HTTP password is "public").

   — **Result:** The ***System Status*** screen appears.

Figure 5-1. Enter Network Password Screen

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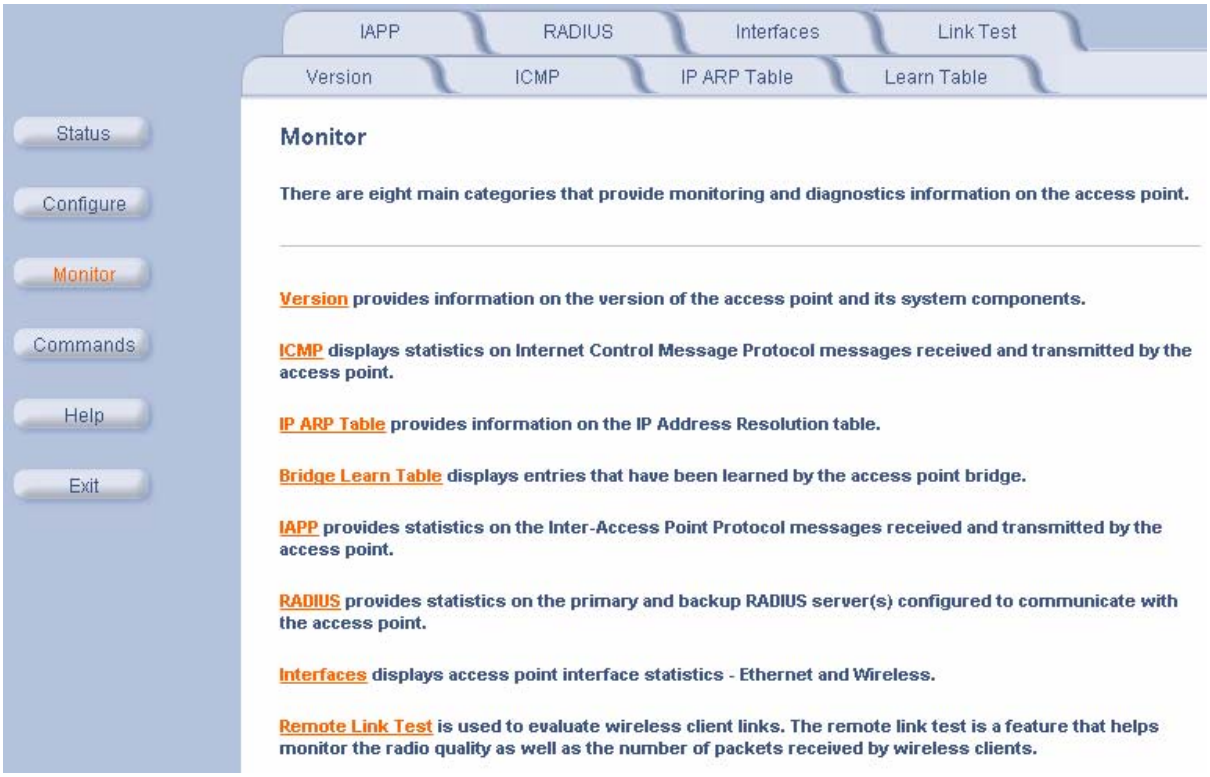
5. Click the **Monitor** button located on the left-hand side of the screen.

Figure 5-2. Monitor Main Screen


IAPP
RADIUS
Interfaces
Link Test
Version
ICMP
IP ARP Table
Learn Table
Status
Configure
Monitor
Commands
Help
Exit
Monitor
There are eight main categories that provide monitoring and diagnostics information on the access point.
Version provides information on the version of the access point and its system components.
ICMP displays statistics on Internet Control Message Protocol messages received and transmitted by the access point.
IP ARP Table provides information on the IP Address Resolution table.
Bridge Learn Table displays entries that have been learned by the access point bridge.
IAPP provides statistics on the Inter-Access Point Protocol messages received and transmitted by the access point.
RADIUS provides statistics on the primary and backup RADIUS server(s) configured to communicate with the access point.
Interfaces displays access point interface statistics - Ethernet and Wireless.
Remote Link Test is used to evaluate wireless client links. The remote link test is a feature that helps monitor the radio quality as well as the number of packets received by wireless clients.

6. Click the tab that corresponds to the statistics you want to review. For example, click **Learn Table** to see the list of nodes that the AP has discovered on the network.
7. If applicable, click the **Refresh** button to update the statistics.

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Version

From the HTTP interface, click the **Monitor** button and select the **Version** tab. The list displayed provides you with information that may be pertinent when calling Technical Support. With this information, your Technical Support representative can verify compatibility issues and make sure the latest software are loaded. This screen displays the following information for each Access Point component:

- **Serial Number:** The component's serial number, if applicable.
- **Component Name**
- **ID:** The AP identifies a system component based on its ID. Each component has a unique identifier.
- **Variant:** Several variants may exist of the same component (for example, a hardware component may have two variants, one with more memory than the other).
- **Version:** Specifies the component's version or build number. The Software Image version is the most useful information on this screen for the typical end user.

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Figure 5-3. Version Information Screen

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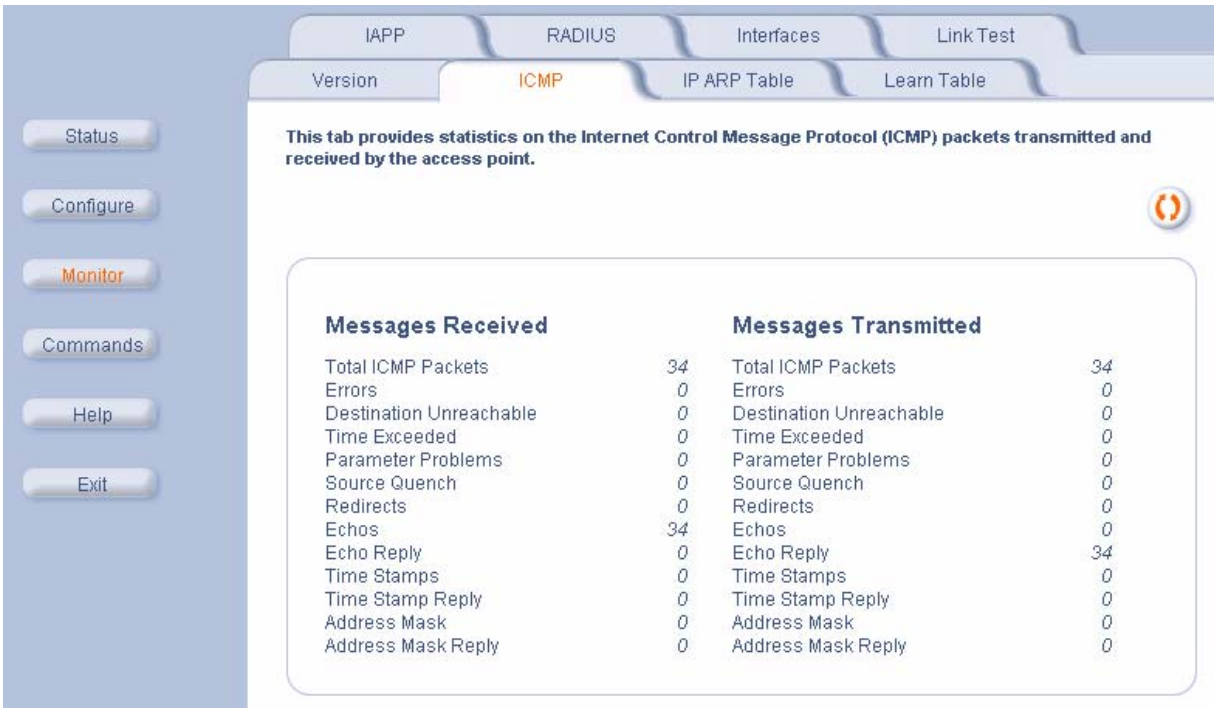
ICMP

This tab provides statistical information for both received and transmitted messages directed to the AP. Not all ICMP traffic on the network is counted in the ICMP (Internet Control Message Protocol) statistics.

Figure 5-4. ICMP Monitoring Screen



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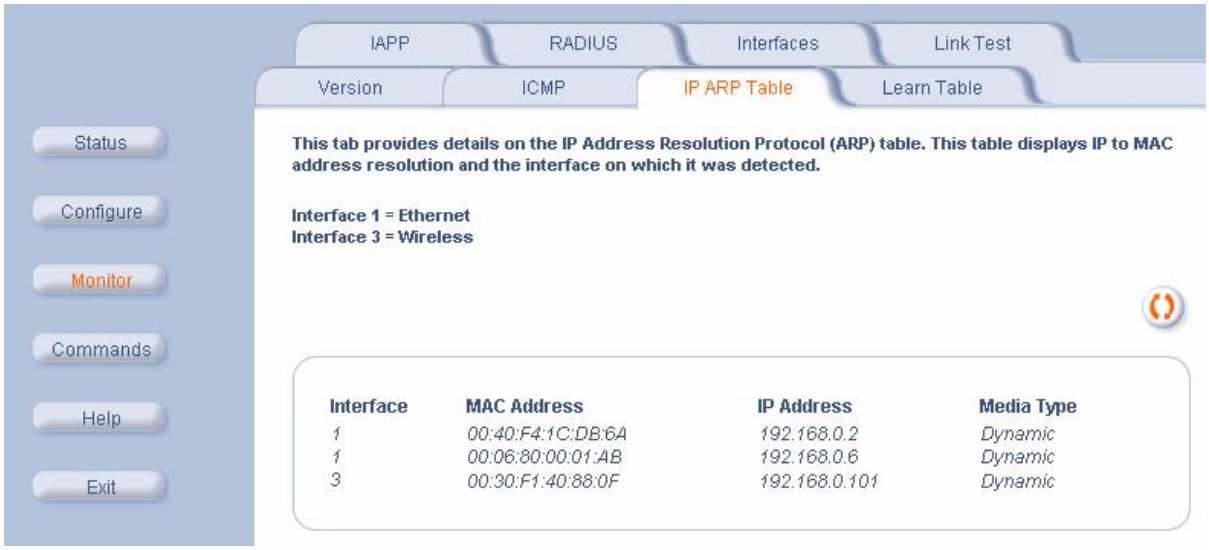
IP/ARP Table

This tab provides information based on the Address Resolution Protocol (ARP), which relates MAC Address and IP Addresses.

Figure 5-5. IP/ARP Table



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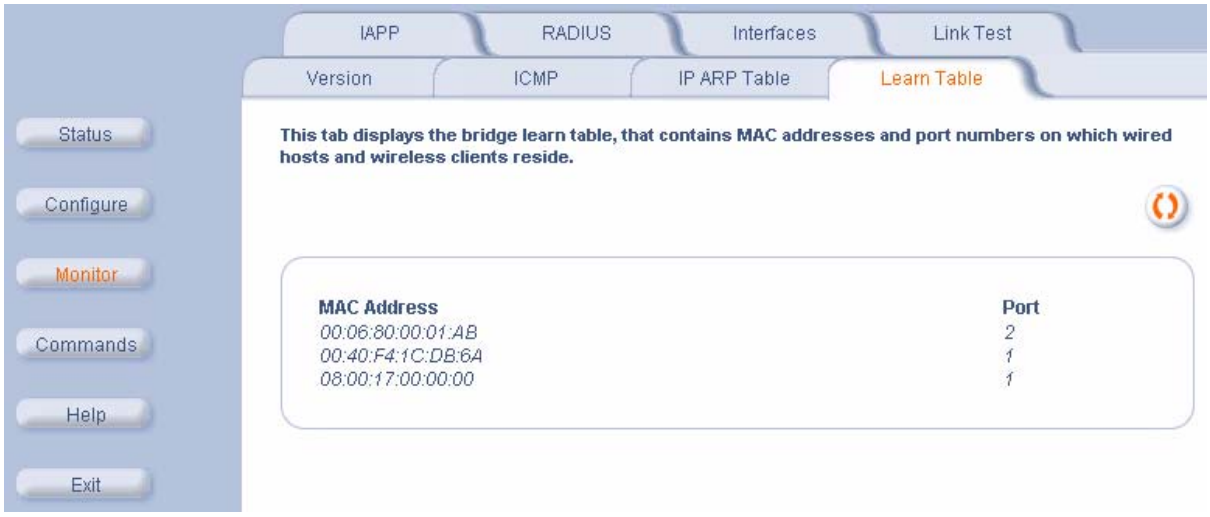
Learn Table

This tab displays information relating to network bridging. It reports the MAC address for each node that the device has learned is on the network and the interface on which the node was detected. There can be up 10,000 entries in the Learn Table.

Figure 5-6. Learn Table



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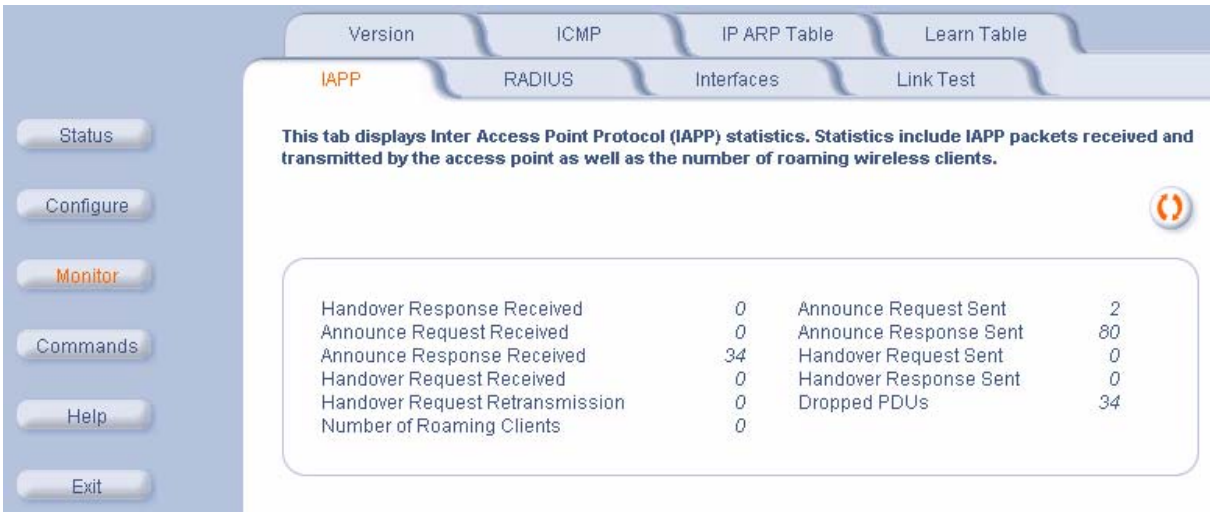
IAPP

This tab displays statistics relating to client handovers and communications between Avaya Wireless Access Points.

Figure 5-7. IAPP Screen



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RADIUS

This tab provides RADIUS authentication and accounting information for both the Primary and Backup RADIUS servers.

NOTE:
RADIUS authentication and accounting must be enabled for this information to be valid.

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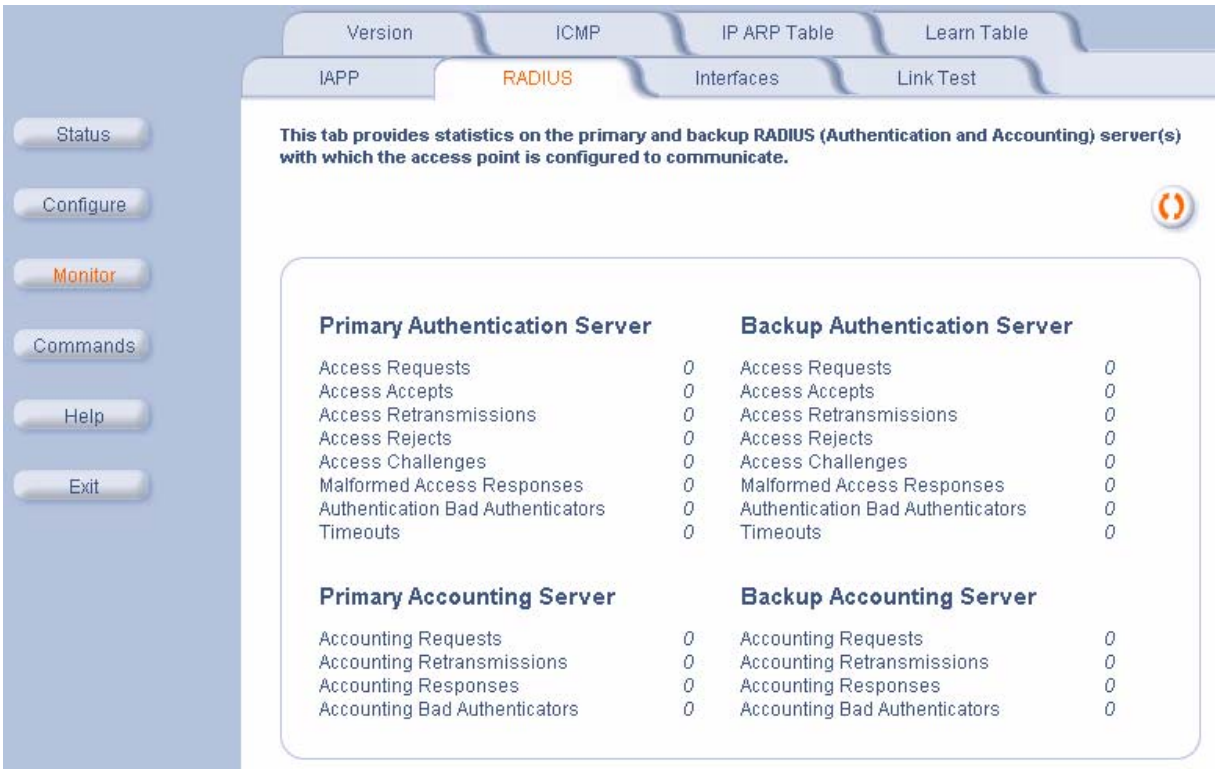
Figure 5-8. RADIUS Monitoring Screen



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Interfaces

This tab displays statistics for the Ethernet and wireless interfaces. The Operational Status can be up, down, or testing.

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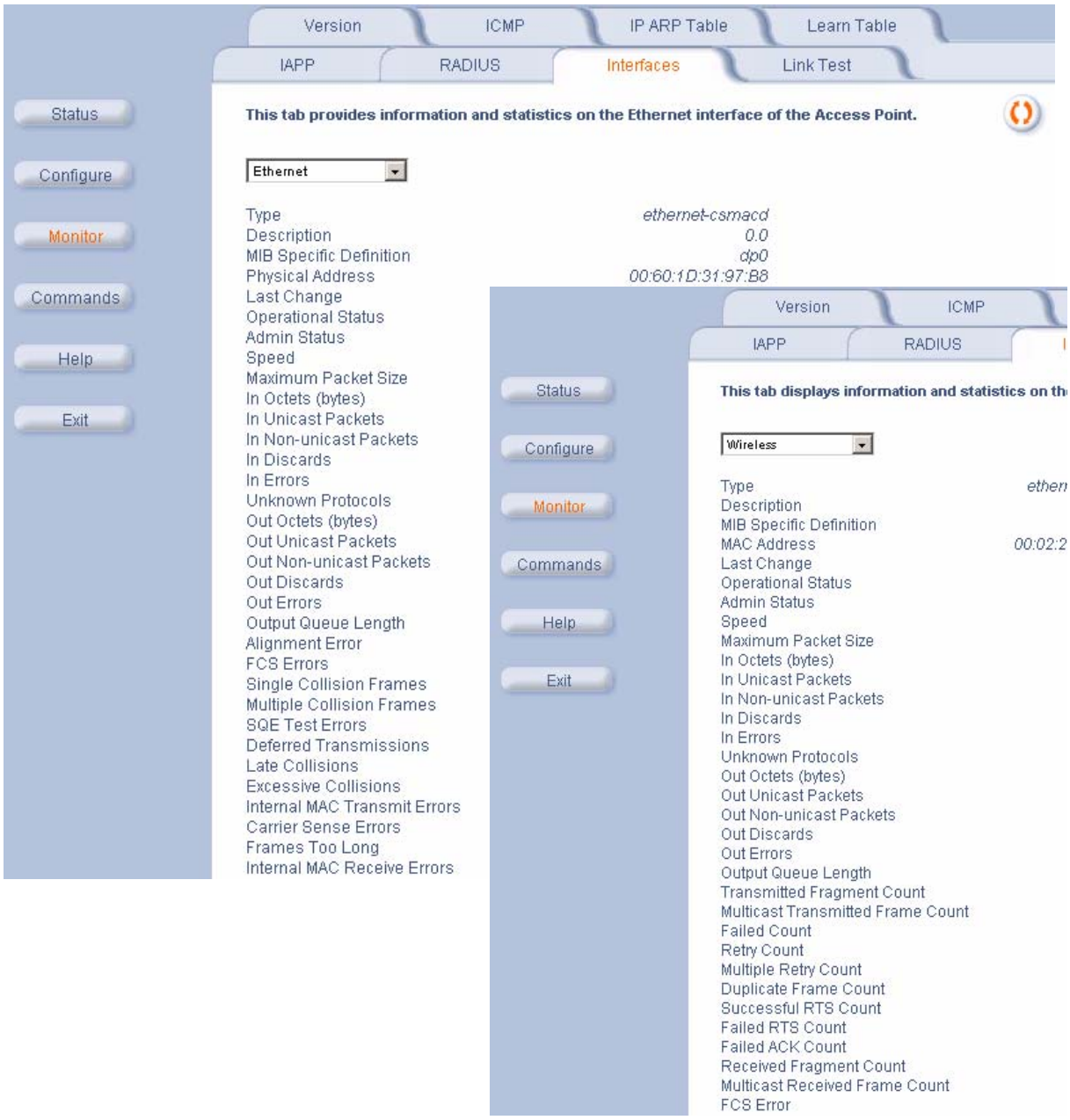
Figure 5-9. Wireless Interface Monitoring



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Link Test (802.11b APs Only)

This tab displays information on the quality of the wireless link to clients and other 802.11b APs in the Wireless Distribution System. During a Link Test, the Access Point and the selected device exchange a series of packets to test the strength of the connection. The devices start by exchanging packets at the 11 Mbits/sec rate but fall back to the slower rates if necessary.

NOTE:
This feature is not available for an 802.11a or 802.11b/g AP. Also, this feature is not available if you are using an Avaya 802.11a/b Card or a non-Avaya Wireless client with an 802.11b AP.

Follow these steps to perform a Link Test:

1. Open the ***Remote Link Test*** screen.
2. Click **Explore**.

   Result: A list of detected stations will appear. If the list does not appear automatically, click **Refresh**.

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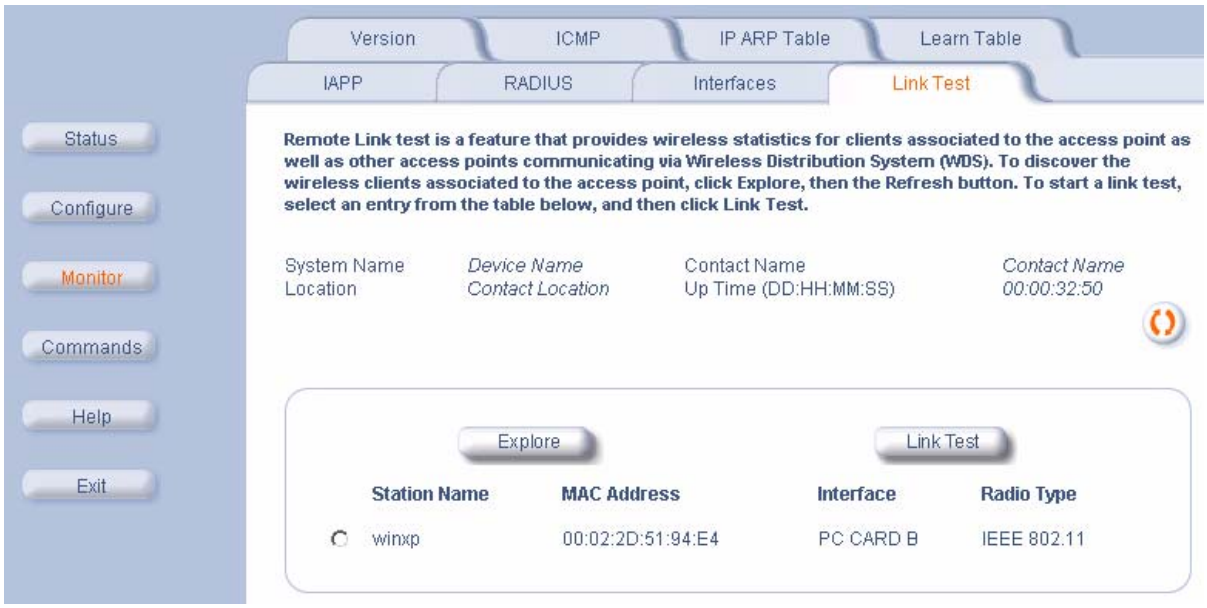
Figure 5-10. Remote Link Test Screen



3. Select a Station from the list by clicking the circle to the left of the Station's entry.
4. Click **Link Test** to start the test.

   Result: A new Link Test window opens and displays the following information for the Access Point (referred to as the **Initiator Station**) and the wireless client (referred to as the **Remote Station**):

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— **Station Name:** The Access Point's System Name or the client's Windows Networking name.

— **MAC Address**

— **SNR (dB):** The Signal to Noise ratio for the received signal. The displayed value is the running average since the start of the test and is reported in decibels (dB). Higher numbers correspond to a stronger link. The bar graph also displays the relative strength of the link (a green bar indicates a strong link, a yellow bar indicates a fair link, and a red bar indicates a weak link).

— **Signal (dBm):** The strength of the received signal in dBm (decibels referenced to 1 milliwatt). The displayed value is the running average since the start of the test and is reported as a negative number. Higher numbers correspond to a stronger link. For example, -40 dBm corresponds to a stronger signal than -50 dBm. The bar graph also displays the relative strength of the signal (a longer bar represents a stronger signal).

— **Noise (dBm):** The strength of the noise detected at the receiver reported in dBm (decibels referenced to 1 milliwatt). The displayed value is the running average since the start of the test and is reported as a negative number. Noise can interfere with the received signal so a smaller noise value corresponds to a stronger link. For example, a noise level of -95 dBm is more desirable than a noise level of -89 dBm. The bar graph displays the relative strength of the noise level (a shorter bar represents a weaker noise level and is more desirable than a longer bar).

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— **11 Mbps (pkts):** The number of packets received at the 11 Mbits/sec transmit rate since the start of the Link Test. In general, most packets will be received at the 11 Mbits/sec rate if the devices have a strong link.

— **5.5 Mbps (pkts):** The number of packets received at the 5.5 Mbits/sec transmit rate since the start of the Link Test.

— **2 Mbps (pkts):** The number of packets received at the 2 Mbits/sec transmit rate since the start of the Link Test.

— **1 Mbps (pkts):** The number of packets received at the 1 Mbits/sec transmit rate since the start of the Link Test.

NOTE:
Click the **Refresh** button periodically to update the test results. The test screen does not refresh automatically.

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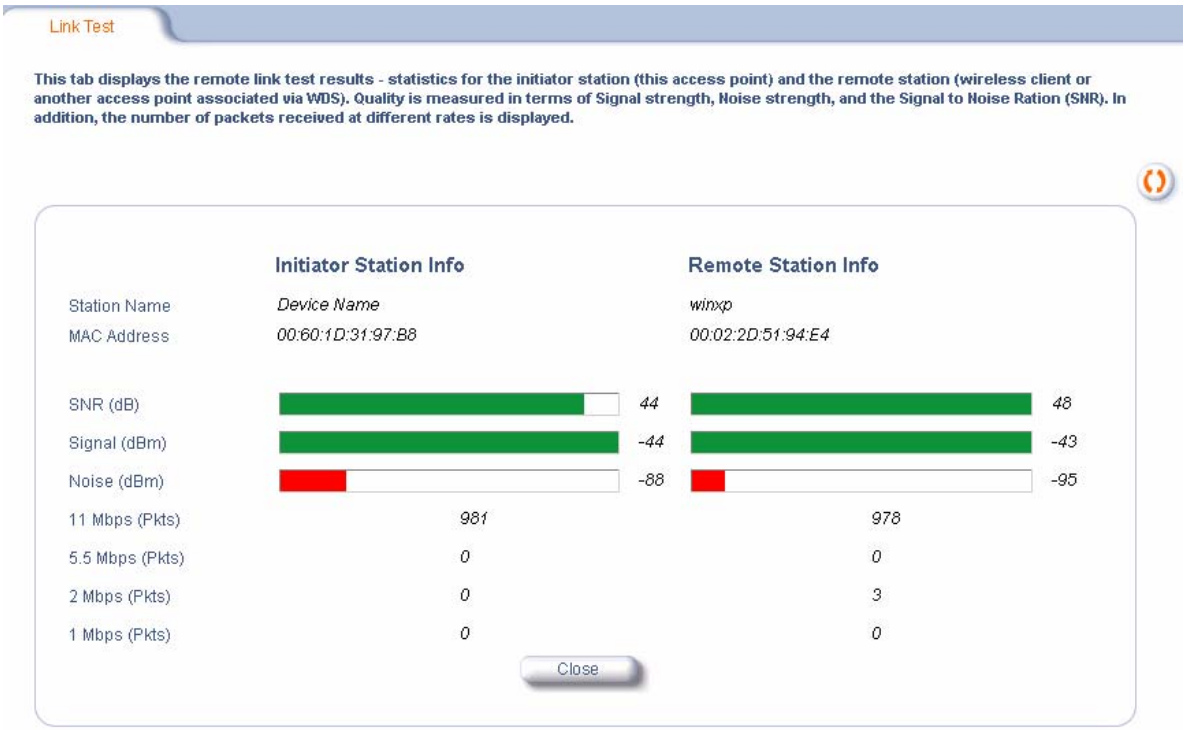
Figure 5-11. SNR Report Screen



5. Click **Close** to end the Link Test.

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AVAYA Commands 6

In This Chapter

- Logging into the HTTP Interface
- Download: Download files from a TFTP server to the AP.
- Upload: Upload configuration files from the AP to a TFTP server.
- Reboot: Reboot the AP in the specified number of seconds.
- Reset: Reset all of the Access Point's configuration settings to factory defaults.
- Help Link: Configure the location where the AP Help files can be found.

Logging into the HTTP Interface

Once the AP has a valid IP Address and an Ethernet connection, you may use your web browser to issue commands.

The Command Line Interface (CLI) also provides a method for issuing commands using Telnet or a serial connection. This section covers only use of the HTTP Interface. For more information about issuing commands with the CLI, refer to Command Line Interface (CLI).

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Follow these steps to view the available commands supported by the AP's HTTP interface:

1. Open a Web browser on a network computer.

NOTE:
The HTTP interface supports the following Web browser:

— Microsoft Internet Explorer 6 with Service Pack 1 or later

— Netscape 6.1 or later

2. If necessary, disable the Internet proxy settings. For Internet Explorer users, follow these steps:

   — Select **Tools > Internet Options...**.

   — Click the **Connections** tab.

   — Click **LAN Settings...**.

   — If necessary, remove the check mark from the **Use a proxy server** box.

   — Click **OK** twice to save your changes and return to Internet Explorer.

3. Enter the Access Point's IP address in the browser's **Address** field and press **Enter**.

   — Result: The ***Enter Network Password*** screen appears.

4. Enter the HTTP password in the **Password** field and click **OK**. Leave the **User Name** field blank. (By default, the HTTP password is "public").

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— **Result:** The ***System Status*** screen appears.

Figure 6-1. Enter Network Password Screen

5. Click the **Commands** button located on the left-hand side of the screen.

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Figure 6-2. Commands Main Screen

Download
Upload
Reboot
Reset
Help Link
Status
Configure
Monitor
Commands
Help
Exit
Commands
There are five commands that can be executed on the access point.
Download is used to download files from a TFTP server to the access point. This feature can be used to upgrade the access point and download configuration files.
Upload is used to upload configuration files from your access point to a TFTP server. This feature can be used to backup the access point configuration file.
Reboot allows you to reboot the access point in the specified number of seconds.
Reset will reset all the configuration settings of the access point to the factory default values.
Help Link is used to configure where the access point help information can be retrieved.

6. Click the tab that corresponds to the command you want to issue. For example, click **Reboot** to restart the unit.

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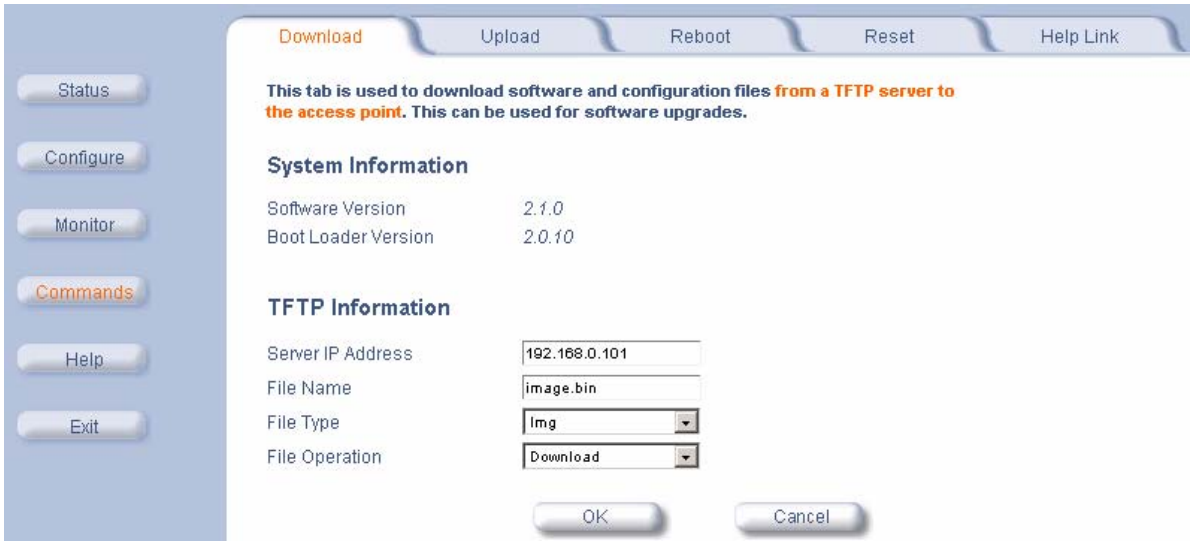
Download

Use the **Download** tab to download Configuration, AP Image, and Bootloader files to the AP. A TFTP server must be running and configured to point to the directory containing the file.

Figure 6-3. Download Command Screen



If you don't have a TFTP server installed on your system, install the TFTP server from the Avaya Wireless CD. You can either install the TFTP server from the CD Wizard or run **OEM-TFTP-Server.exe** found in the CD's *Xtras/SolarWinds* sub-directory.

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The **Download** tab shows version information and allows you to enter TFTP information as described below.

- **Server IP Address:** Enter the TFTP server IP Address.
  - — Double-click the TFTP server icon on your desktop and locate the IP address assigned to the TFTP server. Note: This is the IP address that will be used to point the Access Point to the AP Image file.
- **File Name:** Enter the name of the file to be downloaded (including the file extension).
  - — Copy the updated AP Image file to the TFTP server's root folder. The default AP Image is located at *C:/Program Files/Avaya_Wireless/AP600/*.
- **File Type:** Select the proper file type. Choices include:
  - — **Config** for configuration information, such as System Name, Contact Name, and so on.
  - — **Img** for the AP Image (executable program).
  - — **BspBl** for the Bootloader software.
- **File Operation:** Select either **Download** or **Download & Reboot**. You should reboot the AP after downloading files.

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Upload

Use the **Upload** tab to upload Configuration files from the AP. The TFTP server must be running and configured to point to the directory to which you want to copy the uploaded file. We suggest you assign the file a meaningful name, which may include version or location information.

If you don't have a TFTP server installed on your system, install the TFTP server from the Avaya Wireless CD. You can either install the TFTP server from the CD Wizard or run **OEM-TFTP-Server.exe** found in the CD's *Xtras/SolarWinds* sub-directory.

- **Server IP Address:** Enter the TFTP server IP Address.
  - — Double-click the TFTP server icon on your desktop and locate the IP address assigned to the TFTP server.
- **File Name:** Enter the name of the file to be uploaded.
- **File Type:** Select **Config**.
- **File Operation:** Select **Upload**.

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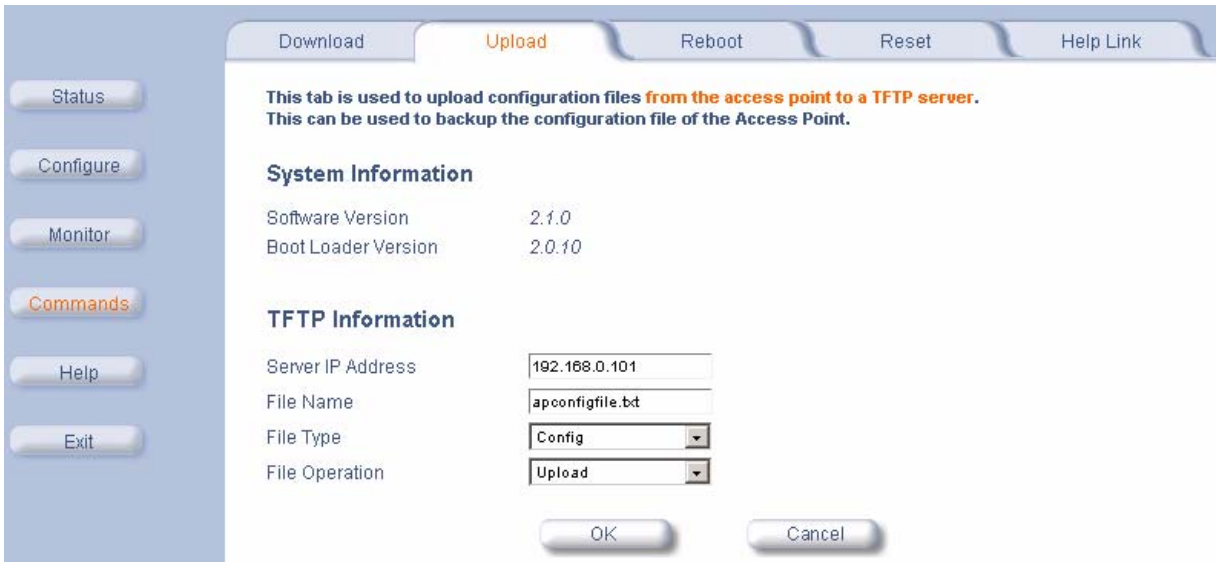
Figure 6-4. Upload Command Screen



Reboot

Use the **Reboot** tab to save configuration changes (if any) and reset the AP. Entering a value of 0 (zero) seconds causes an immediate reboot. Note that **Reset**, described below, does not save configuration changes.

⚠ CAUTION:

Rebooting the AP will cause all users who are currently connected to lose their connection to the network until the AP has completed the restart process and resumed operation.

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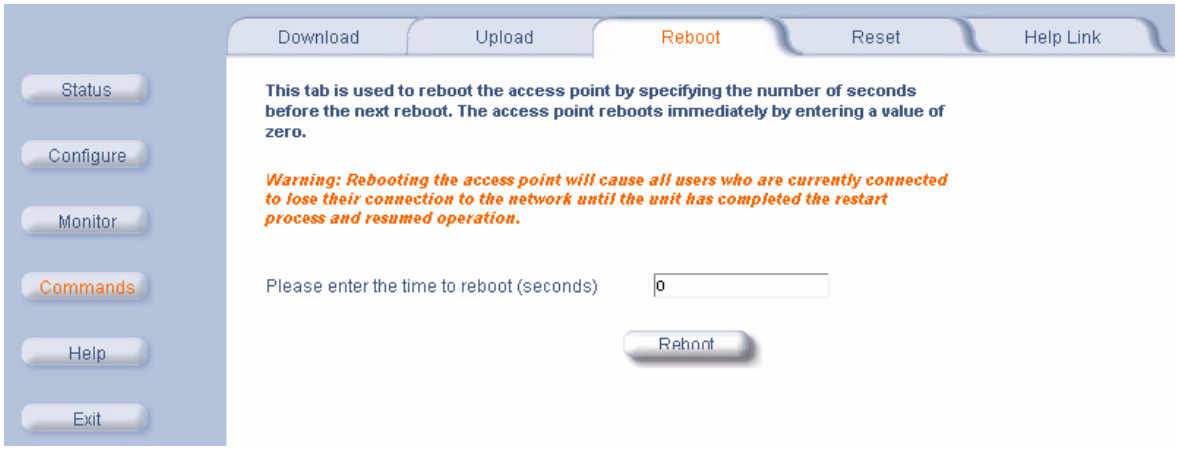
Figure 6-5. Reboot Command Screen


Download
Upload
Reboot
Reset
Help Link
Status
Configure
Monitor
Commands
Help
Exit
This tab is used to reboot the access point by specifying the number of seconds before the next reboot. The access point reboots immediately by entering a value of zero.
Warning: Rebooting the access point will cause all users who are currently connected to lose their connection to the network until the unit has completed the restart process and resumed operation.
Please enter the time to reboot (seconds)
0
Reboot

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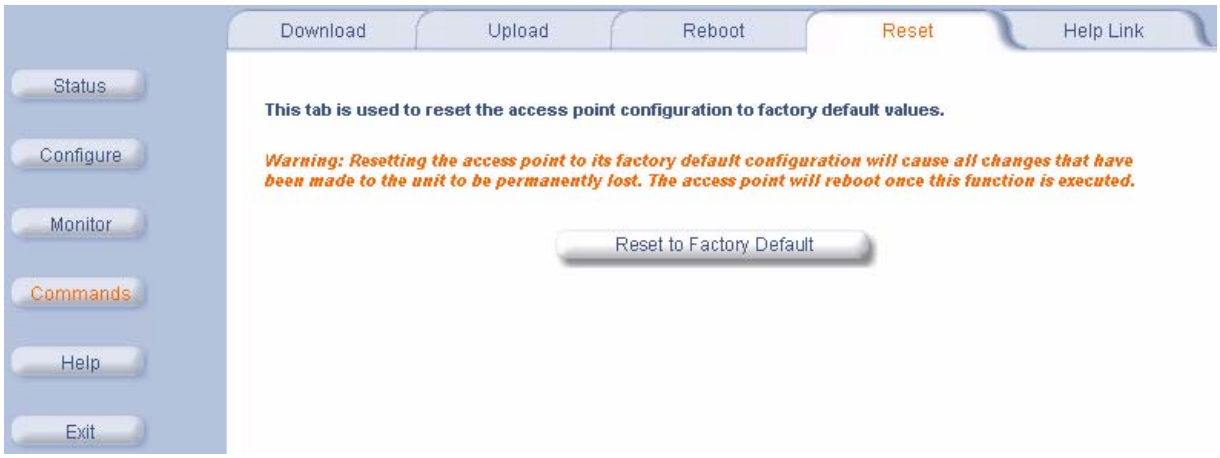
Reset

Use the **Reset** tab to restore the AP to factory default conditions. The AP may also be reset from the **RESET** button located on the side of the unit. Since this will reset the Access Point's current IP address, a new IP address must be assigned. Refer to Recovery Procedures for more information.

⚠ CAUTION:

Resetting the AP to its factory default configuration will permanently overwrite all changes that have made to the unit. The AP will reboot automatically after this command has been issued.

Figure 6-6. Reset to Factory Defaults Command Screen


Download
Upload
Reboot
Reset
Help Link
Status
Configure
Monitor
Commands
Help
Exit
This tab is used to reset the access point configuration to factory default values.
Warning: Resetting the access point to its factory default configuration will cause all changes that have been made to the unit to be permanently lost. The access point will reboot once this function is executed.
Reset to Factory Default

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Help Link

To open **Help**, click the **Help** button on any display screen.

During initialization, the AP on-line help files are downloaded to the default location: **C:/Program Files/Avaya_ Wireless/AP/HTML/index.htm**.

NOTE:
Use the forward slash character ("/") rather than the backslash character ("\") when configuring the **Help Link** location.

The Avaya Wireless AP Help information is available in English, French, German, Italian, Spanish, and Japanese. The Help files are copied to your computer in one language only.

If you want to place these files on a shared drive, copy the Help Folder to the new location, and then specify the new path in the **Help Link** box.

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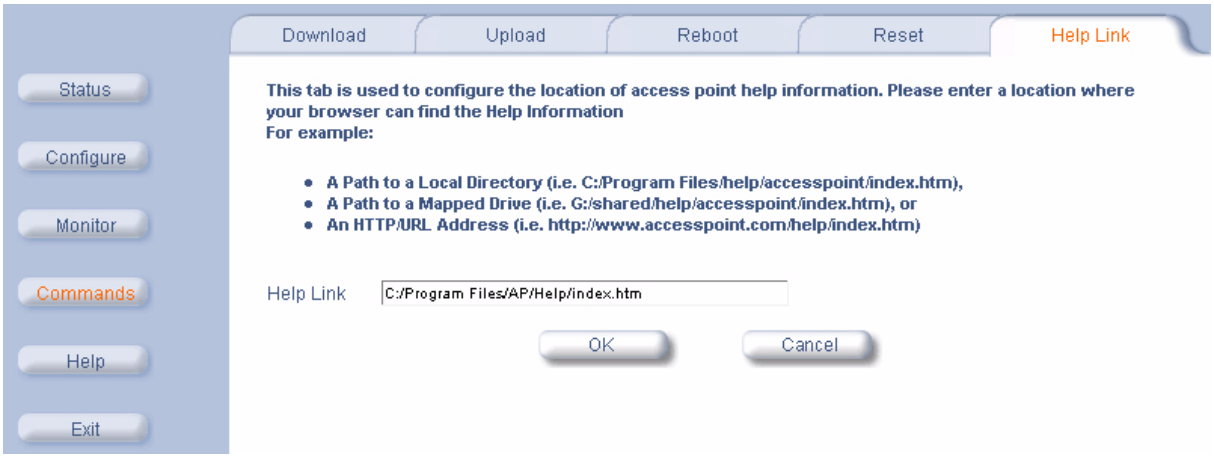
Figure 6-7. Help Link Configuration Screen



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Troubleshooting 7

In This Chapter

- Troubleshooting Concepts
- Symptoms and Solutions
- Recovery Procedures
- Related Applications

NOTE:
This section helps you locate problems related to the AP device setup. For details about RADIUS, TFTP, serial communication programs (such as HyperTerminal), Telnet applications, or web browsers, please refer to the documentation that came with the application for assistance.

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Troubleshooting Concepts

The following list identifies important troubleshooting concepts and topics. The most common initialization and installation problems relate to IP addressing. For example, you must have valid IP addresses for both the AP and the management computer to access the unit's HTTP interface.

- **IP Address management is fundamental.**
- **Factory default units are set for "Dynamic" (DHCP) IP Address assignment.** The default IP address for the AP is 10.0.0.1 if your network does not have a DHCP server. If you connect the AP to a network with an active DHCP server, then use ScanTool to locate the IP address of your unit. If a DHCP server is not active on your subnet, then use ScanTool to assign a static IP address to the unit.
- **The Trivial File Transfer Protocol (TFTP) provides a means to download and upload files.** These files include the AP Image (executable program) and configuration files.
- **If the AP password is lost or forgotten, you will need to reset to default values.** The Reset to Factory Default Procedure resets configuration, but does not change the current AP Image.
- **If all else fails…** Use the Forced Reload Procedure to erase the current AP Image and then download a new image. Once the new image is loaded, use the Reset to Factory Default Procedure to set the unit to factory default values and reconfigure the unit.

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- **The AP Supports a Command Line Interface (CLI).** If you are having trouble locating your AP on the network, connect to the unit directly using the serial interface and refer to Command Line Interface (CLI) for CLI command syntax and parameter names.

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Symptoms and Solutions

Connectivity Issues

Connectivity issues include any problem that prevents you from powering up or connecting to the AP.

AP Unit Will Not Boot - No LED Activity

1. Make sure your power source is operating.
2. Make sure all cables are connected to the AP correctly.
3. If you are using Active Ethernet, make sure you are using a Category 5, foiled, twisted pair cable to power the AP.

Serial Link Does Not Work

1. Make sure you are using a standard, straight-through, 9-pin serial cable.
2. Double-check the physical network connections.

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3. Make sure your PC terminal program (such as HyperTerminal) is active and configured to the following values:

   — Com Port: (COM1, COM2, etc. depending on your computer);

   — Baud rate: 9600; Data bits: 8; Stop bits: 1; Flow Control: None; Parity: None;

   — Line Feeds with Carriage Returns
   (In HyperTerminal select:
   File -> Properties -> Settings -> ASCII Setup -> Send Line Ends with Line Feeds)

Ethernet Link Does Not Work

1. Double-check the physical network connections. Use a known-good unit to make sure the network connection is present. Once you have the AP IP address, you can use the “Ping” command over Ethernet to test the IP Address. If the AP responds to the Ping, then the Ethernet Interface is working properly.
2. By default, the Access Point will attempt to automatically detect the Ethernet settings. However, if you are having problems with the Ethernet link, manually configure the Access Point’s Ethernet settings. For example, if your switch operates at 100 Mbits/sec/Full Duplex, manually configure the Access Point to use these settings (see Ethernet). If you cannot access the unit over Ethernet, then use the CLI interface over the serial port to configure the Ethernet port (see Command Line Interface (CLI) and Set Ethernet Speed and Transmission Mode).
3. Perform network infrastructure troubleshooting (check switches, routers, etc.).

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Basic Software Setup and Configuration Problems

Lost AP, Telnet, or SNMP Password

1. Perform the Reset to Factory Default Procedure in this guide. This procedure resets system and network parameters, but does not affect the AP Image.

   The default AP HTTP password is “public”, and the default Telnet password is also “public”.

Client Computer Cannot Connect

1. Client computers should have the same Network Name and security settings as the AP.
2. Network Names should be allocated and maintained by the Network Administrator.
3. Refer to the documentation that came with your client card for additional troubleshooting suggestions.

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AP Has Incorrect IP Address

1. Default IP Address Assignment mode is dynamic (DHCP). If you do not have a DHCP server on your network, the default IP Address is 10.0.0.1. If you have more than one unintialized AP connected to the network, they will all have the same default IP address and you will not be able to communicate with them (due to an IP address conflict). In this case, assign each AP a static IP address via the serial cable or turn off all units but one and change the IP address using ScanTool one at a time.
2. The AP only contacts a DHCP server during boot-up. If your network's DHCP server is not available while the AP is booting, the device will retain the last IP Address it had. Reboot the AP once your DHCP server is on-line again or use the ScanTool to find the Access Point's current IP address.
3. To find the unit's current IP address if using DHCP, open the IP Client Table in the DHCP Server and match the Access Point's IP address to its MAC address (found on the product label). Alternatively, use ScanTool to identify an Access Point's current IP address.
4. Once you have the current IP address, use the HTTP or CLI Interface to change the unit's IP settings, if necessary.
5. If you use static IP Address assignments, and cannot access the unit over Ethernet, use the Initializing the IP Address using CLI procedure. Once the IP Address is set, you can use the Ethernet Interface to complete configuration.

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6. Perform the Reset to Factory Default Procedure in this guide. This will reset the unit to “DHCP” mode. If there is a DHCP Server on the network, the DHCP Server will assign an IP Address to the AP.

HTTP (browser) or Telnet Interface Does Not Work

1. Make sure you are using a compatible browser:

   — Microsoft Internet Explorer 6 with Service Pack 1 or later

   — Netscape 6.1 or later

2. Make sure you have the proper IP address. Enter your Access Point’s IP Address in the browser address bar, similar to this example:

   http://192.168.1.100

   When the ***Enter Network Password*** window appears, leave the **User Name** field empty and enter the HTTP password in the **Password** field. The default HTTP password is “public”.

3. Use the CLI over the serial port to check the IP Access Table, which can be restricting access to Telnet and HTTP.

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HTML Help Files Do Not Appear

1. Verify that the HTML Help files are installed in the default directory:
   C:\Program Files\Avaya_Wireless\AP\HTML
2. If the Help files are not located in this folder, contact your network administrator to find out where the Help files are located on your server.
3. Perform the following steps to verify the location or to enter the pathname for the Help files:
   a. Click the **Commands** button in the HTTP interface.
   b. Select the **Help** tab located at the top of the screen.
   c. Enter the pathname where the Help files are located in the **Help Link** box.
   d. Click **OK** when finished.

Telnet CLI Does Not Work

1. Make sure you have the proper IP Address. Enter your **AP** IP address in the Telnet connection dialog, from a DOS prompt, type:
   C:\> telnet <AP IP Address>
2. Confirm that your computer has an IP address in the same IP subnet as your Access Point.
3. Use the CLI over the serial port to check the IP Access Table, which can be restricting access to Telnet and HTTP.

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TFTP Server Does Not Work

1. Make sure the TFTP Server has been started.
2. Verify the IP address of the TFTP Server. The server may be local or remote, so long as it has a valid IP address.
3. Configure the TFTP Server to “point” to the folder containing the file to be downloaded (or to the folder in which the file is to be uploaded).
4. Verify that you have entered the proper AP Image file name (including the file extension) and directory path.
5. If you have a problem uploading a file, verify that the TFTP server is configured to allow uploads (typically the default setting is to allow only downloads).

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Client Connection Problems

Client Software Finds No Connection

Make sure you have configured your client software with the proper Network Name and Security settings. Network Names and WEP Keys are typically allocated and maintained by your network administrator.

Client PC Card Does Not Work

1. Make sure you are using the latest PC Card driver software.
2. Download and install the latest *Avaya Wireless* client software from http://www.avaya.com/support.

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Intermittent Loss of Connection

1. Make sure you are within range of an active AP.
2. You can check the signal strength using the signal strength gauge on your client software. If you have an 802.11b AP, you can also use the Remote Link Test available in the Access Point's HTTP interface. See Link Test (802.11b APs Only).

Client Does Not Receive an IP Address - Cannot Connect to Internet

1. If the AP is configured as a DHCP server, open the Web-browser Interface and select the **Configure** button and then the **Network** tab to make sure the proper DHCP settings are being used.
2. If you are not using the DHCP server feature on the AP, then make sure that your local DHCP server is accessible from the Access Point's subnet.
3. From the client computer, use the "ping" network command to test the connection with the AP. If the AP responds, but you still cannot connect to the Internet, there may be a physical network configuration problem (contact your network support staff).
4. If using Active Ethernet, make sure you are not using a crossover Ethernet cable between the AP and the hub.

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VLAN Operation Issues

Verifying Proper Operation of the VLAN Feature

The correct VLAN configuration can be verified by “pinging” both wired and wireless hosts from both sides of the AP device and the network switch. Traffic can be “sniffed” on both the wired (Ethernet) and wireless (WDS) backbones (if configured). Bridge frames generated by wireless clients and viewed on one of the backbones should contain IEEE 802.1Q compliant VLAN headers or tags. The VLAN ID in the headers should correspond to one of the VLAN User IDs configured for the AP.

NOTE:
For Dual-radio APs: APs with an 11a Upgrade Kit or 802.11b/g Kit support up to 16 VLAN/SSID pairs. APs with an 802.11b PC Card or a 5 GHz Upgrade Kit support only one VLAN/SSID per radio.

VLAN Workgroups

The correct VLAN assignment can be verified by pinging the AP to ensure connectivity, by pinging the switch to ensure VLAN properties, and by pinging hosts past the switch to confirm the switch is functional. Ultimately, traffic can be “sniffed” on the Ethernet or WDS interfaces (if configured) using third-party packages. Most problems can be avoided by ensuring that 802.1Q compliant VLAN tags containing the proper VLAN ID have been inserted in the bridged frames. The VLAN ID in the header should correspond to the user’s assigned network name.

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What if network traffic is being directed to a nonexistent host?

- All sessions are disconnected, traffic is lost, and a manual override is necessary
- Workaround: you can configure the switch to mimic the nonexistent host

I have just configured the Management ID and now I can't manage the AP?

- Check to ensure your password is correct. If your password is incorrect or all inbound packets do NOT have the correct tag, then a manual override is necessary.

⚠ CAUTION:
The manual override process disconnects all users and resets all values to factory defaults.

Active Ethernet (AE)

The AP Does Not Work

1. Verify that you are using a standard UTP Category 5 cable.
2. Try a different port on the same AE hub (remember to move the input port accordingly) – if it works, there is probably a faulty port or bad RJ-45 port connection.
3. If possible, try to connect the AP to a different AE hub.

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4. Try using a different Ethernet cable – if it works, there is probably a faulty connection over the long cable, or a bad RJ-45 connection.
5. Check power plug and hub.
6. If the Ethernet link goes down, check the cable, cable type, switch, and hub.

There Is No Data Link

1. Verify that the indicator for the port is “on.”
2. Verify that the AE hub is connected to the Ethernet network with a good connection.
3. Verify that the Ethernet cable is Category 5 or better and is less than 100 meters (approximately 325 feet) in length from the Ethernet source to the AP.
4. Try to connect a different device to the same port on the AE hub – if it works and a link is established, there is probably a faulty data link in the AP.
5. Try to re-connect the AP to a different output port (remember to move the input port accordingly) – if it works, there is probably a faulty output or input port in the AE hub or a bad RJ-45 connection.

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"Overload" Indications

1. Verify that you are not using a cross-over cable between the AE output port and the AP.
2. Verify that there is no short over any of the twisted pair cables.
3. Move the device into a different output port – if it works, there is probably a faulty port or bad RJ-45 connection.

Recovery Procedures

The most common installation problems relate to IP addressing. For example, without the TFTP server IP Address, you will not be able to download a new AP Image to the AP. IP Address management is fundamental. It is recommended that you create a chart to document and validate the IP addresses for your system.

If the password is lost or forgotten, you will need to reset the AP to default values. The Reset to Factory Default Procedure resets configuration settings, but does not change the current AP Image.

If the AP has a corrupted software image, follow the Forced Reload Procedure to erase the current AP Image and download a new image.

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Reset to Factory Default Procedure

Use this procedure to reset the network configuration values, including the Access Point's IP address and subnet mask. The current AP Image is not deleted. Follow this procedure if you forget the Access Point's password:

1. Press and hold the **RELOAD** button for 10 seconds.

NOTE:
See RELOAD and RESET Buttons to identify the buttons. You need to use a pin or the end of a paperclip to press a button.

Result: The AP reboots, and the factory default network values are restored.

2. If not using DHCP, use the ScanTool or CLI over a serial connection to set the IP address, subnet mask, and other IP parameters. See Command Line Interface (CLI) for CLI information.

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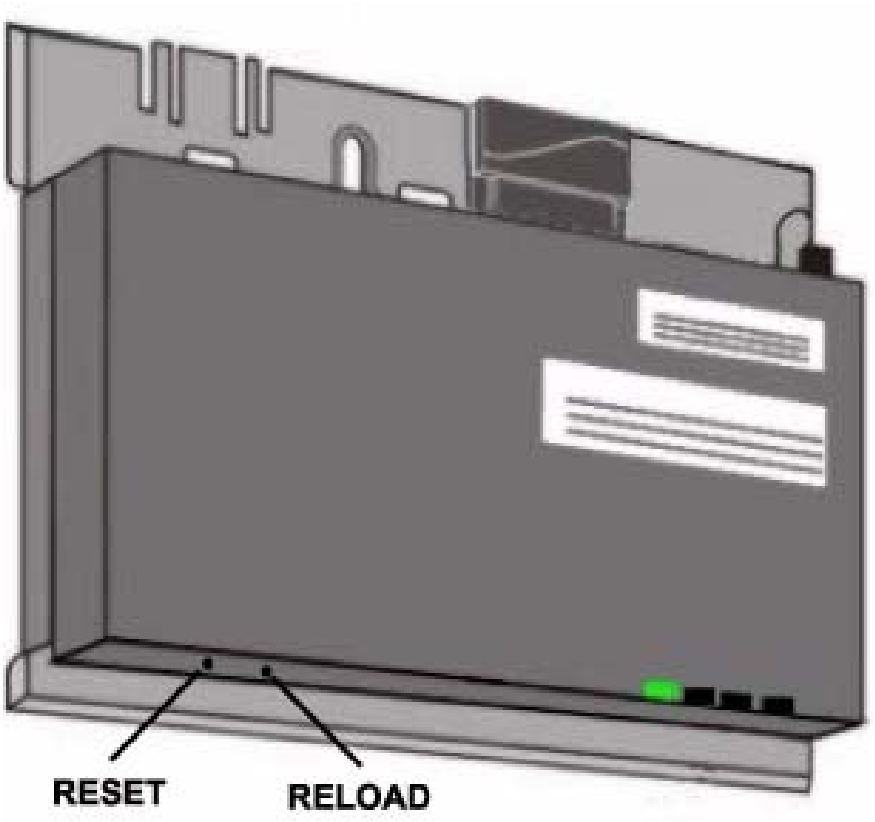
Figure 7-1. RELOAD and RESET Buttons



Forced Reload Procedure

Use this procedure to erase the current AP Image and download a new AP Image. In some cases, specifically when a missing or corrupted AP Image prevents successful booting, you may need to use ScanTool or the Bootloader CLI to download a new executable AP Image.

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NOTE:
This does not delete the AP's configuration (in other words, the Forced Reload Procedure does not reset to device to factory defaults). If you need to force the AP to the factory default state after loading a new AP image, use the Reset to Factory Default Procedure.

For this procedure, you will first erase the AP Image currently installed on the unit and then use either ScanTool or the Bootloader CLI (over the serial port) to set the IP address and download a new AP Image. Follow these steps:

1. While the unit is running, press the **RESET** button.

NOTE:
See RELOAD and RESET Buttons to identify the buttons. You need to use a pin or the end of a paperclip to press a button.

Result: The AP reboots and the indicators begin to flash.

CAUTION:
By completing Step 2, the firmware in the AP will be erased. You will need an Ethernet connection, a TFTP server, and a serial cable (if using the Bootloader CLI) to reload firmware.

2. Press and hold the **RELOAD** button for about 20 seconds until the **POWER LED** turns amber.

   Result: The AP deletes the current AP Image.

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3. Follow one of the procedures below to load a new AP Image to the Access Point:

   — Download a New Image Using ScanTool

   — Download a New Image Using the Bootloader CLI

Download a New Image Using ScanTool

To download the AP Image, you will need an Ethernet connection to the computer on which the TFTP server resides and to a computer that is running ScanTool (this is either two separate computers connected to the same network or a single computer running both programs).

ScanTool detects if an Access Point does not have a valid software image installed. In this case, the **TFTP Server** and **Image File Name** parameters are enabled in the ScanTool's ***Change*** screen so you can download a new image to the unit. (These fields are grayed out if ScanTool does not detect a software image problem.)

Preparing to Download the AP Image

Before starting, you need to know the Access Point's IP address, subnet mask, the TFTP Server IP Address, and the AP Image file name. Make sure the TFTP server is running and configured to point to the folder containing the image to be downloaded.

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Download Procedure

Follow these steps to use ScanTool to download a software image to an Access Point with a missing image:

1. Download the latest software from http://www.avaya.com/support.
2. Copy the latest software updates to your TFTP server.
3. Launch ScanTool.
4. Highlight the entry for the AP you want to update and click **Change**.
5. Set **IP Address Type** to **Static**.

NOTE:
You need to assign static IP information temporarily to the Access Point since its DHCP client functionality is not available when no image is installed on the device.

6. Enter an unused IP address that is valid on your network in the **IP Address** field. You may need to contact your network administrator to get this address.
7. Enter the network's **Subnet Mask** in the field provided.
8. Enter the network's **Gateway IP Address**, if necessary. You may need to contact your network administrator to get this address. You should only need to enter the default gateway address if the Access Point and the TFTP server are separated by a router.
9. Enter the IP address of your TFTP server in the field provided.

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10. Enter the **Image File Name** (including the file extension). Enter the full directory path and file name. If the file is located in the default TFTP directory, you need enter only the file name.
11. Click **OK**.
    — **Result:** The Access Point will reboot and the download will begin automatically. You should see downloading activity begin after a few seconds within the TFTP server's status screen.
12. Click **OK** when prompted that the device has been updated successfully to return to the ***Scan List*** screen.
13. Click **Cancel** to close the ScanTool.
14. When the download process is complete, configure the AP as described in Getting Started and Advanced Configuration.

Download a New Image Using the Bootloader CLI

To download the AP Image, you will need an Ethernet connection to the computer on which the TFTP server resides. This can be any computer on the LAN or connected to the AP with a cross-over Ethernet cable.

You must also connect the AP to a computer with a standard serial cable and use a terminal client, such as HyperTerminal. From the terminal, enter CLI Commands to set the IP address and download an AP Image.

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Preparing to Download the AP Image

Before starting, you need to know the Access Point's IP address, subnet mask, the TFTP Server IP Address, and the AP Image file name. Make sure the TFTP server is running and configured to point to the folder containing the image to be downloaded.

Download Procedure

1. Download the latest software from http://www.avaya.com/support.
2. Copy the latest software updates to your TFTP server's default directory.
3. Use a straight-through serial cable to connect the Access Point's serial port to your computer's serial port.

NOTE:
You must remove the Access Point's cable cover and front cover to access the serial port.

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4. Open your terminal emulation program (like HyperTerminal) and set the following connection properties:

   — Com Port: <COM1, COM2, etc., depending on your computer>

   — Baud rate: 9600

   — Data Bits: 8

   — Stop bits: 1

   — Flow Control: None

   — Parity: None

5. Under **File -> Properties -> Settings -> ASCII Setup**, enable the **Send line ends with line feeds** option.

   Result: HyperTerminal sends a line return at the end of each line of code.

6. Press the **RESET** button on the AP.

   Result: The terminal display shows Power On Self Tests (POST) activity. After approximately 30 seconds, a message indicates: **Sending Traps to SNMP manager periodically**. After this message appears, press the **ENTER** key repeatedly until the following prompt appears:

   ```
   [Device name]>
   ```


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7. Enter only the following statements:

```
[Device name]> set ipaddrtype static
[Device name]> set ipaddr <Access Point IP Address>
[Device name]> set ipsubmask <IP Mask>
[Device name]> set tftpipaddr <TFTP Server IP Address>
[Device name]> set tftpfilename <AP Image File Name,
including file extension>
[Device name]> set ipgw <Gateway IP Address>
[Device name]> show ip (to confirm your new settings)
[Device name]> show tftp (to confirm your new settings)
[Device name]> reboot 0
```

Example:

```
[Device name]> set ipaddrtype static
[Device name]> set ipaddr 10.0.0.12
[Device name]> set ipsubmask 255.255.255.0
[Device name]> set tftpipaddr 10.0.0.20
[Device name]> set tftpfilename MyImage.bin
[Device name]> set ipgw 10.0.0.30
[Device name]> show ip
[Device name]> show tftp
[Device name]> reboot 0
```

Result: The AP will reboot and then download the image file. You should see downloading activity begin after a few seconds within the TFTP server's status screen.

8. When the download process is complete, configure the AP as described in Getting Started and Advanced Configuration.

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Setting IP Address using Serial Port

Use the following procedure to set an IP address over the serial port using the CLI. The network administrator typically provides the AP IP address.

Hardware and Software Requirements

- Standard straight-through serial data (RS-232) cable with a one male DB-9 connector and one female DB-9 connector. The AP comes with a female 9-pin serial port.
- ASCII Terminal software, such as HyperTerminal.

Attaching the Serial Port Cable

1. Unlock and remove the cable cover from the AP.
2. Remove the front cover from the AP to reveal the serial port.
3. Connect one end of the serial cable to the AP and the other end to a serial port on your computer.
4. Power on the computer and AP, if necessary.

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Initializing the IP Address using CLI

After installing the serial port cable, you may use the CLI to communicate with the AP. CLI supports most generic terminal emulation programs, such as HyperTerminal (which is included with the Windows operating systems). In addition, many web sites offer shareware or commercial terminal programs you can download. Once the IP address has been assigned, you can use the HTTP interface or the CLI over Telnet to complete configuration.

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Follow these steps to assign the AP an IP address:

1. Open your terminal emulation program (like HyperTerminal) and set the following connection properties:

   — Com Port: <COM1, COM2, etc., depending on your computer>

   — Baud rate: 9600

   — Data Bits: 8

   — Stop bits: 1

   — Flow Control: None

   — Parity: None

2. Under **File -> Properties -> Settings -> ASCII Setup**, enable the **Send line ends with line feeds** option.

   Result: HyperTerminal sends a line return at the end of each line of code.

3. Press the **RESET** button on the AP (see RELOAD and RESET Buttons to identify the location of the **RESET** button).

   Result: The terminal display shows Power On Self Tests (POST) activity, and then displays a CLI prompt, similar to the example below. This process may take up to 90 seconds.

   `[Device name]>` **Please enter password:**

4. Enter the CLI password (default is **public**).

   Result: The terminal displays a welcome message and then the CLI Prompt:

   `[Device name]>`

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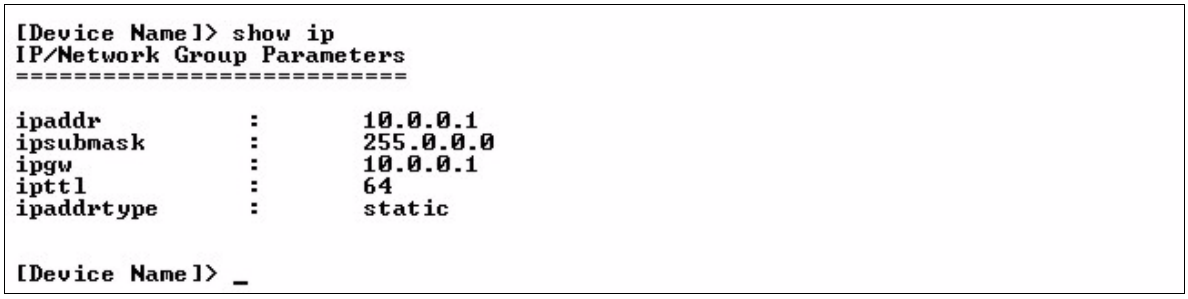
5. Enter **show ip**. Result: Network parameters appear:

Figure 7-2. Result of "show ip" CLI Command



6. Change the IP address and other network values using **set** and **reboot** CLI commands, similar to the example below (use your own IP address and subnet mask). Note that IP Address Type is set to Dynamic by default. If you have a DHCP server on your network, you should not need to manually configure the Access Point's IP address; the Access Point will obtain an IP address from the network's DHCP server during boot-up.

   Result: After each entry the CLI reminds you to reboot; however wait to reboot until all commands have been entered.

   [Device name]> **set ipaddrtype static**

   [Device name]> **set ipaddr <IP Address>**

   [Device name]> **set ipsubmask <IP Subnet Mask>**

   [Device name]> **set ipgw <Default Gateway IP Address>**

   [Device name]> **show ip** (to confirm your new settings)

   [Device name]> **reboot 0**

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7. After the AP reboots, verify the new IP address by reconnecting to the CLI and enter a **show ip** command. Alternatively, you can ping the AP from a network computer to confirm that the new IP address has taken effect.
8. When the proper IP address is set, use the HTTP interface or CLI over Telnet to configure the rest of the unit's operating parameters.

Related Applications

RADIUS Authentication Server

If you enabled RADIUS Authentication on the AP, make sure that your network's RADIUS servers are operational. Otherwise, clients will not be able to log in. There are several reasons the authentication server services might be unavailable, here are two typical things to check:

- Make sure you have the proper RADIUS authentication server information setup configured in the AP. Check the RADIUS Authentication Server's Shared Secret and Destination Port number (default is 1812; for RADIUS Accounting, the default is 1813).
- Make sure the RADIUS authentication server RAS setup matches the AP.

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TFTP Server

The “Trivial File Transfer Protocol” (TFTP) server allows you to transfer files across a network. You can upload configuration files from the AP for backup or copying, and you can download configuration files or new software images. The TFTP software is located on the Avaya Wireless AP Installation CD-ROM.

If a TFTP server is not configured and running, you will not be able to download and upload images and configuration files to/from the AP. Remember that the TFTP server does not have to be local, so long as you have a valid TFTP IP address. Note that you do not need a TFTP server running unless you want to transfer files to or from the AP.

After the TFTP server is installed:

- Check to see that TFTP is configured to point to the directory containing the AP Image.
- Make sure you have the proper TFTP server IP Address, the proper AP Image file name, and that the TFTP server is connected.
- **Make sure the TFTP server is configured to both send and receive, with no time-out.**

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Command Line Interface (CLI) A

In This Appendix

This section describes the AP's Command Line (CLI) Interface. CLI commands can be used to initialize, configure, and manage the Access Point.

CLI commands may be entered in real time through a keyboard or submitted with CLI scripts.

The CLI is available through both the Serial Port interface and over the Ethernet interface using Telnet.

NOTE:
All CLI commands and parameters are case-sensitive.

- General Notes
- Command Line Interface (CLI) Variations
- CLI Command Types
- Using Tables & User Strings
- Configuring the AP using CLI commands
- Set Basic Configuration Parameters

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- Other Network Settings
- CLI Monitoring Parameters
- Parameter Tables

General Notes

Prerequisite Skills and Knowledge

To use this document effectively, you should have a working knowledge of Local Area Networking (LAN) concepts, network access infrastructures, and client-server relationships. In addition, you should be familiar with software setup procedures for typical network operating systems and servers.

Notation Conventions

- Computer prompts are shown as constant width type. For example: `[Device name]>`
- Information that you input as shown is displayed in bold constant width type. For example: `[Device name]> **set ipaddr 10.0.0.12**`
- The names of keyboard keys, software buttons, and field names are displayed in bold type. For example: Click the **Configure** button.
- Screen names are displayed in bold italics. For example, the ***System Status*** screen.

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Important Terminology

Term	Description
Configuration Files	Database files containing the current Access Point configuration. Configuration items include the IP Address and other network-specific values. Config files may be downloaded to the Access Point or uploaded for backup or troubleshooting.
Download vs. Upload	Downloads transfer files to the Access Point. Uploads transfer files from the Access Point. The TFTP server performs file transfers in both directions.
Group	A logical collection of network parameter information. For example, the System Group is composed of several related parameters.
Groups can also contain Tables.	All items for a given Group can be displayed with a **show <Group>** CLI Command.
Image File	The Access Point software executed from RAM. To update an Access Point you typically download a new Image File. This file is often referred to as the “AP Image”.

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Term	Description
Parameter	A fundamental network value that can be displayed and may be changeable. For example, the Access Point must have a unique IP Address and the Wireless interface must be assigned an SSID. Change parameters with the CLI **set** Command, and view them with the CLI **show** Command.
Table	Tables hold parameters for several related items. For example, you can add several potential managers to the SNMP Table. All items for a given Table can be displayed with a **show <Table>** CLI Command.
TFTP	Refers to the TFTP Server, used for file transfers.

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Navigation and Special Keys

This CLI supports the following navigation and special key functions to move the cursor along the prompt line.

Key Combination	Operation
Delete or Backspace	Delete previous character
Ctrl-A	Move cursor to beginning of line
Ctrl-E	Move cursor to end of line
Ctrl-F	Move cursor forward one character
Ctrl-B	Move cursor back one character
Ctrl-D	Delete the character the cursor is on
Ctrl-U	Delete all text to left of cursor
Ctrl-P	Go to the previous line in the history buffer
Ctrl-N	Go to the next line in the history buffer
Tab	Complete the command line
?	List available commands

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CLI Error Messages

The following table describes the error messages associated with improper inputs or expected CLI behavior.

Error Message	Description
Syntax Error	Invalid syntax entered at the command prompt.
Invalid Command	A non-existent command has been entered at the command prompt.
Invalid Parameter Name	An invalid parameter name has been entered at the command prompt.
Invalid Parameter Value	An invalid parameter value has been entered at the command prompt.
Invalid Table Index	An invalid table index has been entered at the command prompt.
Invalid Table Parameter	An invalid table parameter has been entered at the command prompt.
Invalid Table Parameter Value	An invalid table parameter value has been entered at the command prompt.
Read Only Parameter	User is attempting to configure a read-only parameter.
Incorrect Password	An incorrect password has been entered in the CLI login prompt.
Download Unsuccessful	The download operation has failed due to incorrect TFTP server IP Address or file name.
Upload Unsuccessful	The upload operation has failed due to incorrect TFTP server IP Address or file name.

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Command Line Interface (CLI) Variations

Administrators use the CLI to control Access Point operation and monitor network statistics. The AP supports two types of CLI: the Bootloader CLI and the normal CLI. The Bootloader CLI provides a limited command set, and is used when the current AP Image is bad or missing. The Bootloader CLI allows you to assign an IP Address and download a new image. Once the image is downloaded and running, the Access Point uses the normal CLI. This guide covers the normal CLI unless otherwise specified.

Bootloader CLI

The Bootloader CLI is a minimal subset of the normal CLI used to perform initial configuration of the AP. This interface is only accessible via the serial interface if the AP does not contain a software image or a download image command over TFTP has failed.

The Bootloader CLI provides you with the ability to configure the initial setup parameters as well as download a software image to the device.

The following functions are supported by the Bootloader CLI:

- configuration of initial device parameters using the **set** command
- **show** command to view the device's configuration parameters
- **help** command to provide additional information on all commands supported by the Bootloader CLI
- **reboot** command to reboot the device

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The parameters supported by the Bootloader CLI (for viewing and modifying) are:

- System Name
- IP Address Assignment Type
- IP Address
- IP Mask
- Gateway IP Address
- TFTP Server IP Address
- Image File Name (including the file extension)

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The following lists display the results of using the **help** command in the Bootloader CLI:

Figure A-1. Results of "help" bootloader CLI command

```
[Device name]> help

Command List          Description
============          ===========
set                   Set system parameters
show                  Show running system information
help                  Description of commands, command usage and parameters
reboot                reboot the target

Command Usage
=============
set <parameter name> <parameter value> <cr>
show <cr>
help <cr>
reboot <cr>

Parameter List        Description
==============        ===========
sysname               System Name
ipaddr                System IP Address
ipsubmask             System Subnet Mask
ipgw                  System Default Gateway IP Address
tftpipaddr            TFTP Server IP Address
tftpfilename          Image or Binary File name
ipaddrtype            System IP Address Type - STATIC or DYNAMIC

[Device name]>
```


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The following lists display the results of using the **show** command in the Bootloader CLI:

Figure A-2. Results of "show" bootloader CLI command

```
[Device name]> show


sysname          Device name          System Name
ipaddr           10.0.0.1             System IP Address
ipsubmask        255.0.0.0            System Subnet Mask
ipgw             10.0.0.1             System Default Gateway IP Address
ipaddrtype       DYNAMIC              IP Address type
tftpipaddr       10.0.0.2             TFTP Server IP Address
tftpfilename     FILENAME             Image or Binary File Name

[Device name]>
```


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CLI Command Types

This guide divides CLI Commands into two categories: Operational and Parameter Controls.

Operational CLI Commands

These commands affect Access Point behavior, such as downloading, rebooting, and so on. After entering commands (and parameters, if any) press the **Enter** key to execute the Command Line.

Operational commands include:

- **?:** Typing a question mark lists CLI Commands or parameters, depending on usage (you do not need to type Enter after typing this command)
- **done, exit, quit:** Terminates the CLI session
- **download:** Uses TFTP server to download “image”, “config”, or “bootloader upgrade” files to Access Point
- **help:** Displays general CLI help information or command help information, such as command usage and syntax
- **history:** Remembers commands to help avoid re-entering complex statements
- **passwd:** Sets the Access Point’s CLI password
- **reboot:** Reboots the Access Point in the specified time

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- **search:** Lists the parameters in a specified Table
- **upload:** Uses TFTP server to upload "config" files from Access Point to TFTP default directory or specified path

? (List Commands)

This command can be used in a number of ways to display available commands and parameters.

The following table lists each operation and provides a basic example. Following the table are detailed examples and display results for each operation.

Operation	Basic Example
Display the Command List (Example 1)	`[Device Name]>?`
Display commands that start with specified letters (Example 2)	`[Device Name]>s?`
Display parameters for set and show Commands (Examples 3a and 3b)	`[Device Name]>set ?` `[Device Name]>show ipa?`
Prompt to enter successive parameters for Commands (Example 4)	`[Device Name]>download ?`

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Example 1. Display Command list

To display the Command List, enter **?**.

```
[Device Name]>?
```

Figure A-3. Result of "?" CLI command

```
[Device Name]>
show
set
download
upload
reboot
passwd
help
quit
done
exit
history
search
[Device Name]> _
```

Example 2. Display specific Commands

To show all commands that start with specified letters, enter one or more letters, then **?** with no space between letters and **?**.

```
[Device Name]>s?
```

Figure A-4. Result of "s?" CLI command

```
[Device Name]> s
show                set                 search
```


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Example 3. Display parameters for set and show

Example 3a allows you to see every possible parameter for the set (or show) commands. Notice from example 3a that the list is very long. Example 3b shows how to display a subset of the parameters based on initial parameter letters.

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Example 3a. Display every parameter that can be changed

```
[Device Name]>set ?
```

Figure A-5. Result of "set ?" CLI command

```
[Device Name]> set
Command Description:
The set command modifies the value of a given scalar parameter or table entry.

Command Usage:
set <parameter> <parameter value> <CR>
set <table> <index> <arg1> <value1> ..... <argN> <valueN> <CR>

Example:
set sysname "My Wireless Device" <CR>
set mgmtipaccesstbl 0 ipaddr 10.0.0.10 ipmask 255.255.0.0 cmt "Test WorkStation"
 <CR>

[Device Name]> set
broadcastflttbl
dhcpgw
dhcpippooltbl
dhcppridnsipaddr
dhcpsecdnsipaddr
dhcpstatus
dnsdomainname
dnsprisvripaddr
dnssecsvripaddr
dnsstatus
etherfltifbitmask
.
.
.
.
telsessiontout
tftpfilename
tftpfiletype
tftpipaddr
vlanidtbl
vlanmgmtid
vlanstatus
wdstbl
wif
wifsec
[Device Name]> set _
```


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Example 3b. Display parameters based on letter sequence

This example shows entries for parameters that start with the letter “i”. The more letters you enter, the fewer the results returned. Notice that there is no space between the letters and the question mark.

```
[Device Name]> show ipa?
```

Figure A-6. Result of “show ipa?” CLI command

```
[Device Name]> show ipa
ipaddr              ipaddrtype          iparp
iparpfltipaddr      iparpfltstatus      iparpfltsubmask
```

```
[Device Name]> show iparp?
```

Figure A-7. Result of “show iparp?” CLI command

```
[Device Name]> show iparp
iparp               iparpfltipaddr      iparpfltstatus
iparpfltsubmask
[Device Name]> show iparp_
```


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Example 4. Display Prompts for Successive Parameters

Enter the command, a space, and then **?**. Then, when the parameter prompt appears, enter the parameter value. Result: The parameter is changed and a new CLI line is echoed with the new value (in the first part of the following example, the value is the IP Address of the TFTP server).

After entering one parameter, you may add another **?** to the new CLI line to see the next parameter prompt, and so on until you have entered all of the required parameters. The following example shows how this is used for the **download** Command. The last part of the example shows the completed **download** Command ready for execution.

```
[Device Name]> download ?
<TFTP IP Address>

[Device Name]> download 192.168.0.101 ?
<File Name>

[Device Name]> download 192.168.0.101 apimage ?
<file type (config/img/bootloader)>

[Device Name]> download 192.168.0.101 apimage img <CR>
```


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done, exit, quit

Each of the following commands ends a CLI session:

```
[Device Name]> done
[Device Name]> exit
[Device Name]> quit
```

download

Downloads the specified file from a TFTP server to the Access Point. Executing **download** in combination with the asterisks character ("*") will make use of the previously set TFTP parameters. Executing download without parameters will display command help and usage information.

1. Syntax to download a file:
   Device Name]>**download <tftp server address> <path and filename> <file type>**

   Example:
   [Device Name]>**download 192.168.1.100 APImage2 img**
2. Syntax to display help and usage information:
   [Device Name]>**download**
3. Syntax to execute the download Command using previously set (stored) TFTP Parameters:
   [Device Name]>**download ***

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help

Displays instructions on using control-key sequences for navigating a Command Line and displays command information and examples.

1. Using help as the only argument:

```
[Device Name]>help
```

Figure A-8. Results of "help" CLI command

```
[Device Name]> help
Type ? at the command prompt for a command list.

Complete command description and command usage can be provided by:
help <command name> <CR>
<command name> help <CR>

Special keys supported:
Arrow Keys
DEL, BS .... delete previous character
Ctrl-A  .... go to beginning of line
Ctrl-E  .... go to end of line
Ctrl-F  .... go forward one character
Ctrl-B  .... go backward one character
Ctrl-D  .... delete current character
Ctrl-U, X .. delete to beginning of line
Ctrl-K  .... delete to end of line
Ctrl-W ..... delete previous word
Ctrl-T ..... transpose previous character
Ctrl-P  .... go to previous line in history buffer
Ctrl-N  .... go to next line in history buffer

Tab     .... will attempt command completion
# .... Comment Character
?       .... will provide command listing

Examples:
 '?'            list all the supported commands
'sh?'           list all commands that start with sh
'show ?'        list all arguments to the show command
'sh<TAB>'       complete the 'show' command

[Device Name]>
```


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2. Complete command description and command usage can be provided by:

   `[Device Name]>`**`help <command name>`**

   `[Device Name]>`**`<command name> help`**

history

Shows content of Command History Buffer. The Command History Buffer stores command statements entered in the current session. To avoid re-entering long command statements, use the keyboard “up arrow” (Ctrl-P) and “down arrow” (Ctrl-N) keys to recall previous statements from the Command History Buffer. When the desired statement reappears, press the **Enter** key to execute, or you may edit the statement before executing it.

`[Device Name]>` **`history`**

passwd

Changes the CLI Password.

`[Device Name]>` **`passwd oldpassword newpassword newpassword`**

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reboot

Reboots Access Point after specified number of seconds. Specify a value of 0 (zero) for immediate reboot.

```
[Device Name]> reboot 0
[Device Name]> reboot 30
```

search

Lists the parameters supported by the specified table. This list corresponds to the table information displayed in the HTTP interface. In this example, the CLI returns the list of parameters that make up an entry in the IP Access Table.

```
[Device Name]> search mgmtipaccesstbl
```

Figure A-9. Results of "search mgmtipaccesstbl" CLI command

```
[Device Name]> search mgmtipaccesstbl
The supported elements are:
index
ipaddr
ipmask
cmt
status
```


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upload

Uploads a text-based configuration file from the AP to the TFTP Server. Executing **upload** with the asterisk character (“*”) will make use of the previously set/stored TFTP parameters. Executing **upload** without parameters will display command help and usage information.

1. Syntax to upload a file:

   ```
   [Device Name]>upload <tftp server address> <path and filename> <filetype>
   ```

   Example:

   ```
   [Device Name]>upload 192.168.1.100 APconfig.sys config
   ```

2. Syntax to display help and usage information:

   ```
   [Device Name]>help upload
   ```

3. Syntax to execute the upload command using previously set (stored) TFTP Parameters:

   ```
   [Device Name]>upload *
   ```


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Parameter Control Commands

The following sections cover the two Parameter Control Commands (**show** and **set**) and include several tables showing parameter properties. These commands allow you to view (**show**) all parameters and statistics and to change (**set**) parameters.

- **show:** To see any Parameter or Statistic value, you can specify a single parameter, a Group, or a Table.
- **set:** Use this CLI Command to change parameter values. You can use a single CLI statement to modify Tables, or you can modify each parameter separately.

"show" CLI Command

Displays the value of the specified parameter, or displays all parameter values of a specified group (parameter table). Groups contain Parameters and Tables. Tables contain parameters for a series of similar entities.

To see a definition and syntax example, type only **show** and then press the **Enter** key. To see a list of available parameters, enter a question mark (**?**) after **show** (example: **show ?**).

Syntax:

```
[Device Name]>show <parameter>
[Device Name]>show <group>
[Device Name]>show <table>
```


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Examples:

```
[Device Name]>show ipaddr
[Device Name]>show network
[Device Name]>show mgmtipaccesstbl
```

"set" CLI Command

Sets (modifies) the value of the specified parameter. To see a definition and syntax example, type only **set** and then press the **Enter** key. To see a list of available parameters, enter a space, then a question mark (**?**) after **set** (example: **set?**).

Syntax:

```
[Device Name]>set <parameter> <value>
[Device Name]>set <table> <index> <argument 1> <value 1>
... <argument N> <value N>
```

Example:

```
[Device Name]>set sysloc "Main Lobby"
[Device Name]>set mgmtipaccesstbl 0 ipaddr 10.0.0.10
ipmask 255.255.0.0
```


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Configuring Objects that Require Reboot

Certain objects supported by the Access Point require a device reboot in order for the changes to take effect. In order to inform the end-user of this behavior, the CLI provides informational messages when the user has configured an object that requires a reboot. The following messages are displayed as a result of the configuring such object or objects.

Example 1: Configuring objects that require the device to be rebooted

The following message is displayed every time the user has configured an object that requires the device to be rebooted.

```
[Device Name]>set ipaddr 135.114.73.10
The following elements require reboot

ipaddr
```


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Example 2: Executing the “exit”, “quit”, or “done” commands when an object that requires reboot has been configured

In addition to the above informational message, the CLI also provides a message as a result of the **exit**, **quit**, or **done** command if changes have been made to objects that require reboot. If you make changes to objects that require reboot and execute the exit command the following message is displayed:

[Device Name]>**exit<CR>** OR **quit<CR>** OR **done<CR>**

```
Modifications have been made to parameters that require the
device to be rebooted. These changes will only take effect
after the next reboot.
```


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"set" and "show" Command Examples

In general, you will use the CLI **show** Command to view current parameter values and use the CLI **set** Command to change parameter values. As shown in the following examples, parameters may be set individually or all parameters for a given table can be set with a single statement.

Example 1 - Set the Access Point IP Address Parameter

Syntax:

```
[Device Name]>set <parameter name> <parameter value>
```

Example:

```
[Device Name]> set ipaddr 10.0.0.12
```

Result: IP Address will be changed when you reboot the Access Point. The CLI reminds you when rebooting is required for a change to take effect. To reboot immediately, enter **reboot 0** (zero) at the CLI prompt.

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Example 2 - Create a table entry or row

Use 0 (zero) as the index to a table when creating an entry. When creating a table row, only the mandatory table elements are required (comment is usually an optional table element). For optional table elements, the default value is generally applied if you do not specify a value.

Syntax:

```
[Device Name]>set
<table name> <table index> <element 1> <value 1> …
      <element n> <value n>
```

Example:

```
[Device Name]> set mgmtipaccesstbl 0 ipaddr 10.0.0.10
ipmask 255.255.0.0
```

Result: A new table entry is created for IP address 10.0.0.10 with a 255.255.0.0 subnet mask.

Example 3 - Modify a table entry or row

Use the index to be modified and the table elements you would like to modify. For example, suppose the IP Access Table has one entry and you wanted to modify the IP address:

```
[Device Name]>set mgmtipaccesstbl 1 ipaddr 10.0.0.11
```


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You can also modify several elements in the table entry. Enter the index number and specific table elements you would like to modify. (Hint: Use the search Command to see the elements that belong to the table.)

```
[Device Name]>set mgmtipaccesstbl 1 ipaddr 10.0.0.12
              ipmask 255.255.255.248 cmt "First Row"
```

Example 4 - Enable, Disable, or Delete a table entry or row

The following example illustrates how to manage the second entry in a table.

Syntax:

```
[Device Name]>set <Table> index status <enable, disable,
delete>
[Device Name]>set <Table> index status <1=enable,
2=disable, 3=delete>
```

Example:

```
[Device Name]>set mgmtipaccesstbl 2 status enable
[Device Name]>set mgmtipaccesstbl 2 status disable
[Device Name]>set mgmtipaccesstbl 2 status delete
[Device Name]>set mgmtipaccesstbl 2 status 2
```

NOTE:
You may need to enable a disabled table entry before you can change the entry's elements.

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Example 5 - Show the Group Parameters

This example illustrates how to view all elements of a group or table.

Syntax:

`[Device Name]>` **`show <group name>`**

Example:

`[Device Name]>`**`show network`**

Result: The CLI displays network group parameters. Note **`show network`** and **`show ip`** return the same data.

Figure A-10. Results of "show network" and "show ip" CLI Commands

```
[Device Name]> show network
IP/Network Group Parameters
===========================

ipaddr          :       10.0.0.1
ipsubmask       :       255.0.0.0
ipgw            :       10.0.0.1
ipttl           :       64
ipaddrtype      :       static


[Device Name]> show ip
IP/Network Group Parameters
===========================

ipaddr          :       10.0.0.1
ipsubmask       :       255.0.0.0
ipgw            :       10.0.0.1
ipttl           :       64
ipaddrtype      :       static


[Device Name]> _
```


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Example 6 - Show Individual and Table Parameters

1. View a single parameter.

   Syntax:

   `[Device Name]>`**`show <parameter name>`**

   Example:

   `[Device Name]>` **`show ipaddr`**

   Result: Displays the Access Point IP address.

Figure A-11. Result of "show ipaddr" CLI Command

```
[Device Name]> show ipaddr
ipaddr

10.0.0.1

[Device Name]> _
```

2. View all parameters in a table.

   Syntax:

   `[Device Name]>` **`show <table name>`**

   Example: `[Device Name]>` **`show mgmtipaccesstbl`**

   Result: Displays the IP Access Table and its entries.

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Using Tables & User Strings

Working with Tables

Each table element (or parameter) must be specified, as in the example below.

```
[Device Name]>set mgmtipaccesstbl 0 ipaddr 10.0.0.10 ipmask
255.255.0.0
```

Below are the rules for creating, modifying, enabling/disabling, and deleting table entries.

- **Creation**
  - — The table name is required.
  - — The table index is required – for table entry/instance creation the index is always zero (0).
  - — The order in which the table arguments or objects are entered in not important.
  - — Parameters that are not required can be omitted, in which case they will be assigned the default value.

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- **Modification**
  - — The table name is required.
  - — The table index is required – to modify the table, “index” must be the index of the entry to be modified.
  - — Only the table objects that are to be modified need to be specified. Not all the table objects are required.
  - — If multiple table objects are to be modified the order in which they are entered is not important.
  - — If the entire table entry is to be modified, all the table objects have to be specified.
- **Enabling/Disabling**
  - — The table name is required.
  - — The table index is required – for table enabling/disabling the index should be the index of the entry to be enabled/disabled.
  - — The entry’s new state (either “enable” or “disable”) is required.
- **Deletion**
  - — The table name is required.
  - — The table index is required – for table deletion the index should be the index of the entry to be deleted.
  - — The word “delete” is required.

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Using Strings

Since there are several string objects supported by the AP, a string delimiter is required for the strings to be interpreted correctly by the command line parser. For this CLI implementation, the single quote or double quote character can be used at the beginning and at the end of the string.

For example:

```
[Device Name]> set sysname Lobby - Does not need quote marks
[Device Name]> set sysname "Front Lobby" - Requires quote
                                          marks.
```

The scenarios supported by this CLI are:

“My Desk in the office”	Double Quotes
‘My Desk in the office’	Single Quotes
“My ‘Desk’ in the office”	Single Quotes within Double Quotes

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‘My “Desk” in the office’	Double Quotes within Single Quotes
“Daniel’s Desk in the office”	One Single Quote within Double Quotes
‘Daniel”s Desk in the office’	One Double Quote within Single Quotes

The string delimiter does not have to be used for every string object. The single quote or double quote only has to be used for string objects that contain blank space characters. If the string object being used does not contain blank spaces, then the string delimiters, single or double quotes, mentioned in this section are not required.

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Configuring the AP using CLI commands

Log into the AP using HyperTerminal

1. Open your terminal emulation program (like HyperTerminal) and set the following connection properties:
   - — Com Port: <COM1, COM2, etc., depending on your computer>
   - — Baud rate: 9600
   - — Data Bits: 8
   - — Stop bits: 1
   - — Flow Control: None
   - — Parity: None
2. Under **File -> Properties -> Settings -> ASCII Setup**, enable the **Send line ends with line feeds** option.

   Result: HyperTerminal sends a line return at the end of each line of code.
3. Enter the CLI password (default is **public**).

NOTE:
Avaya recommends changing your default passwords immediately. To perform this operation using CLI commands, refer to Change Passwords.

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Log into the AP using Telnet

The CLI commands can be used to access, configure, and manage the AP using Telnet. Follow these steps:

1. Confirm that your computer's IP address is in the same IP subnet as the AP.

NOTE:
If you have not previously configured the Access Point's IP address and do not have a DHCP server on the network, the Access Point will default to an IP address of 10.0.0.1.

2. Go to the DOS command prompt on your computer.
3. Type **telnet <IP Address of the unit>**.
4. Enter the CLI password (default is **public**).

NOTE:
Avaya recommends changing your default passwords immediately. To perform this operation using CLI commands, refer to Change Passwords.

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Set Basic Configuration Parameters

There are a few basic configuration parameters that you may want to setup right away when you receive the AP. For example:

- Set System Name, Location and Contact Information
- Set Static IP Address for the AP
- Download an AP Configuration File from your TFTP Server
- Set Network Names for the Wireless Interface
- Set WEP Encryption for the Wireless Interface
- Download an AP Configuration File from your TFTP Server
- Backup your AP Configuration File

Set System Name, Location and Contact Information

```
[Device Name]>set sysname <system name> sysloc <Unit Location>
[Device Name]>set sysctname <Contact Name (person responsible
              for system)>
[Device Name]>set sysctphone <Contact Phone Number> sysctemail
              <Contact E-mail address>
[Device Name]>show system
```


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Figure A-12. Result of "show system" CLI Command

```
[Device Name]> show system
System Parameters
=================

sysname                    :       Device Name
sysloc                     :       System Location
sysctname                  :       Contact Name
sysctemail                 :       name@Organization.com
sysctphone                 :       Contact Phone Number
sysuptime (DD:HH:MM:SS)    :        0:11: 6:40
sysoid                     :       1.3.6.1.4.1.11898.2.4.6
sysdescr                   :        AP v2.1.0  SN-02UT16570004 v2.0.10
sysservices                :       2
sysflashupdate             :       0
sysflashbckint             :       120
sysresettodefaults         :       0


[Device Name]> _
```

Set Static IP Address for the AP

NOTE:
The IP Subnet Mask of the AP must match your network's Subnet Mask.

```
[Device Name]>set ipaddrtype static
[Device Name]>set ipaddr <fixed IP address of unit>
[Device Name]>set ipsubmask <IP Mask>
[Device Name]>set ipgw <gateway IP address>
[Device Name]>show network
```


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Change Passwords

```
[Device Name]>passwd <Old Password> <New Password> <Confirm
              Password> (CLI password)
[Device Name]>set httppasswd <New Password> (HTTP interface
              password)
[Device Name]>set snmprpasswd <New Password> (SNMP read
              password)
[Device Name]>set snmprwpasswd <New Password> (SNMP read/write)
[Device Name]>reboot 0
```

⚠ CAUTION:

Avaya strongly urges you to change the default passwords to restrict access to your network devices to authorized personnel. If you lose or forget your password settings, you can always perform the Reset to Factory Default Procedure.

Set Network Names for the Wireless Interface

```
[Device Name]>set wif <index 3 (Single-radio APs) or 3 or 4
              (Dual-radio APs)> netname <Network Name (SSID) for
              wireless interface>
[Device Name]>show wif
```


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Figure A-13. Results of "show wif" CLI command for an AP

```
[Device Name]> show wif
Wireless Interface Table
========================


Index                           :       3
Network Name                    :       My Wireless Network A
Distance Between APs            :       large
Interference Robustness         :       disable
DTIM Period                     :       1
Automatic Channel Selection     :       enable
Frequency Channel               :       56
RTS/CTS Medium Reservation      :       2347
Multicast Rate                  :       2 MBps
Closed System                   :       disable
Load Balancing                  :       enable
Medium Density Distribution     :       disable
MAC Address                     :       00:30:F1:65:09:E9
Supported Data Rates            :       6 9 12 18 24 36 48 54
Supported Frequency Channels    :       52 56 60 64 36 40 44 48 149 153 157 161
Physical Layer Type             :       OFDM
Regulatory Domain List          :       USA (FCC)
Transmit Rate                   :       0
TurboMode                       :       disable
```


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Set WEP Encryption for the Wireless Interface

⚠ CAUTION:

Wireless clients must be configured with the same encryption key to be able to communicate with the AP. The AP can only support one Key Length (so each of the configured keys must have the same length). The available key sizes vary based on the Access Point's model. See Security Encryption Key Length Table for more information.

You can set up to four encryption keys. This example describes setting encryption Key 1 on the wireless card in Slot A (if applicable; a Single-radio AP uses index 3; a Dual-radio AP uses index 3 for Slot A and index 4 for Slot B).

```
[Device Name]>set wifsec 3 encryptstatus enable encryptkey1 <WEP
              key (number of characters vary depending on AP model)>
              encryptkeytx key1
[Device Name]>show wifsec
```


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Figure A-14. Result of "show wifsec" CLI Command

```
[Device Name]> show wifsec
Wireless Security table
==============


Index                      :              3
EnableEncryption           :        disable
EncryptionKey1             :       ********
EncryptionKey2             :       ********
EncryptionKey3             :       ********
EncryptionKey4             :       ********
Encryption Key in Use      :           key1
Deny Non Encrypted Data    :         enable
```

Download an AP Configuration File from your TFTP Server

Begin by starting your TFTP program. It must be running and configured to transmit and receive.

[Device Name]>**set tftpfilename <file name> tftpfiletype config tftpipaddr <IP address of your TFTP server>**

[Device Name]>**show tftp** (to ensure the filename, file type, and the IP address are correct)

[Device Name]>**download ***

[Device Name]>**reboot 0**

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After following the complete process (above) once, you can download a file of the same name (so long as all the other parameters are the same), with the following command:

```
[Device Name]>download *
```

Backup your AP Configuration File

Begin by starting your TFTP program. It must be running and configured to transmit and receive.

`[Device Name]>`**`upload <TFTP Server IP address>`**
`<tftpfilename` (such as “config.sys”)**`> config`**
`[Device Name]>`**`show tftp`** (to ensure the filename, file type, and the IP address are correct)

After setting the TFTP parameters, you can backup your current file (so long as all the other parameters are the same), with the following command:

```
[Device Name]>upload *
```


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Other Network Settings

There are other configuration settings that you may want to set for the AP. Some of them are listed below.

- Configure the AP as a DHCP Server
- Configure the DNS Client
- Maintain Client Connections using Link Integrity
- Change your Wireless Interface Settings
- Set Ethernet Speed and Transmission Mode
- Set Interface Management Services
- Configure MAC Access Control
- Set RADIUS Parameters
- Set VLAN/SSID Parameters

NOTE:
Refer to Advanced Configuration for more information on these settings.

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Configure the AP as a DHCP Server

NOTE:
You must have at least one entry in the DHCP Server IP Address Pool Table before you can set the DHCP Server Status to Enable.

```
[Device Name]>set dhcpstatus disable
[Device Name]>set dhcpippooltbl 0 startipaddr <start ip address>
                  endipaddr <end ip address>
[Device Name]>set dhcpgw <gateway ip address>
[Device Name]>set dhcppridnsipaddr <primary dns ip address>
[Device Name]>set dhcpsecdnsipaddr <secondary dns ip address>
[Device Name]>set dhcpstatus enable
[Device Name]>reboot 0
```

CAUTION:
Before enabling this feature, confirm that the IP address pools you have configured are valid addresses on the network and do not overlap the addresses assigned by any other DHCP server on the network. Enabling this feature with incorrect address pools will cause problems on your network.

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Configure the DNS Client

```
[Device Name]>set dnsstatus enable
[Device Name]>set dnsprisvripaddr <IP address of primary DNS server>
[Device Name]>set dnssecsvripaddr <IP address of secondary DNS server>
[Device Name]>set dnsdomainname <default domain name>
[Device Name]>show dns
```

Figure A-15. Results of "show dns" CLI command

```
[Device Name]> show dns
DNS Client Group
================

dnsstatus       :       disable
dnsprisvripaddr :       0.0.0.0
dnssecsvripaddr :       0.0.0.0
dnsdomainname   :
```


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Maintain Client Connections using Link Integrity

```
[Device Name]>show linkinttbl (this shows the current links)
[Device Name]>set linkinttbl <1-5 (depending on what table row
you wish to address)>
            ipaddr <ip address of the host computer you want to
check>
[Device Name]>set linkintpollint <the interval between link
integrity checks>
[Device Name]>set linkintpollretx <number of times to retransmit
before considering
              the link down>
[Device Name]>set linkintstatus enable
[Device Name]>show linkinttbl (confirm new settings)
[Device Name]>reboot 0
```

Change your Wireless Interface Settings

See Interfaces for information on the parameters listed below. Single-radio APs use index 3. Dual-radio APs use index 3 for Slot A and index 4 for Slot B.

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Operational Mode (802.11b/g)

```
[Device Name]>set wif <index> mode <see table>
```

mode	Operational Mode
1	dot11b-only
2	dot11g-only
3	dot11bg
5	dot11g-wifi

Autochannel Select (ACS)

ACS is enabled by default. Reboot after disabling or enabling ACS.

```
[Device Name]>set wif <index> autochannel <enable/disable>
[Device Name]>reboot 0
```

Enable/Disable Closed System

```
[Device Name]>set wif <index> closedsys <enable/disable>
```

Enable/Disable Interference Robustness (802.11b Only)

```
[Device Name]>set wif <index> interrobust <enable/disable>
```


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Enable/Disable Load Balancing (802.11b Only)

```
[Device Name]>set wif <index> ldbalance <enable/disable>
```

Enable/Disable Medium Density Distribution (802.11b Only)

```
[Device Name]>set wif <index> meddendistrib <enable/disable>
```

Set the Distance Between APs (802.11b Only)

```
[Device Name]>set wif <index> distaps <large, medium, small,
              minicell, microcell>
[Device Name]>reboot 0
```

NOTE:
The distance between APs should not be approximated. It is calculated by means of a manual Site Survey, in which an AP is set up and clients are tested throughout the area to determine signal strength and coverage, and local limits such as physical interference are investigated. From these measurements the appropriate cell size and density is determined, and the optimum distance between APs is calculated to suit your particular business requirements.

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Set the Multicast Rate (802.11b Only)

```
[Device Name]>set wif <index> multrate <1,2,5.5,11 (Mbits/sec)>
```

NOTE:
The Distance Between APs **must be set before** the Multicast Rate.

Set Ethernet Speed and Transmission Mode

```
[Device Name]>set etherspeed <value (see below)>
[Device Name]>reboot 0
```

Ethernet Speed and Transmission Mode	Value
10 Mbits/sec - half duplex	10halfduplex
10 Mbits/sec - full duplex	10fullduplex
10 Mbits/sec - auto duplex	10autoduplex
100 Mbits/sec - half duplex	100halfduplex
100 Mbits/sec - full duplex	100fullduplex
Auto Speed - half duplex	autohalfduplex
Auto Speed - auto duplex	autoautoduplex (default)

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Set Interface Management Services

Edit Management IP Access Table

```
[Device Name]>set mgmtipaccesstbl <index> ipaddr <IP address>
ipmask <subnet mask>
```

Configure Management Ports

```
[Device Name]>set snmpifbitmask <(see below)>
[Device Name]>set httpifbitmask <(see below)>
[Device Name]>set telifbitmask <(see below)>
```

Choose from the following values:

Interface bitmask	Description
0 or 2 = disable (all interfaces)	All management channels disabled
1 or 3 = Ethernet only	Ethernet only enabled
4 or 6 = Wireless A only	Wireless A only enabled
8 or 10 = Wireless B only	Wireless B only enabled

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Interface bitmask	Description
12 = Wireless A and Wireless B	Wireless A and Wireless B enabled
13 or 15 = all interfaces	All management channels enabled

Set Communication Ports

```
[Device Name]>set httpport <HTTP port number (default is 80)>
[Device Name]>set telport <Telnet port number (default is 23)>
```

Set Telnet Session Timeouts

```
[Device Name]>set tellogintout <time in seconds between 1 and
300 (default is 30)>
[Device Name]>set telsessiontout <time in seconds between 1 and
36000 (default is 900)>
```

Configure Serial Port Interface

NOTE:
To avoid unexpected performance issues, leave Flow Control at the default setting (none) unless you are sure what this setting should be.

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```
[Device Name]>set serbaudrate <2400, 4800, 9600, 19200, 38400,
              57600>
[Device Name]>set serflowctrl <none, xonxoff>
[Device Name]>show serial
```

Figure A-16. Result of "show serial" CLI Command

```
[Device Name]> show serial
Serial Interface Group Parameters
=================================

serbaudrate              :       9600
serdatabits              :       8
serparity                :       none
serstopbits              :       1
serflowctrl              :       none
```

Configure Syslog

```
[Device Name]>set syslogpriority <1-7 (default is 6)>
[Device Name]>set syslogstatus <enable/disable>
```

Configure Intra BSS

```
[Device Name]>set intrabssoptype <passthru (default)/block)>
```


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Configure MAC Access Control

Setup MAC (Address) Access Control

```
[Device Name]>set macaclstatus enable
[Device Name]>set macacloptype <passthru, block>
[Device Name]>reboot 0
```

Add an Entry to the MAC Access Control Table

```
[Device Name]>set macacltbl <index> macaddr <MAC Address> status
enable
[Device Name]>show macacltbl
```

Disable or Delete an Entry in the MAC Access Control Table

```
[Device Name]>set macacltbl <index> status <disable/delete>
[Device Name]>show macacltbl
```

NOTE:
For larger networks that include multiple Access Points, you may prefer to maintain this list on a centralized location using the RADIUS parameters (see Set RADIUS Parameters).

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Configure Authentication Mode

Single-radio APs use index 3. Dual-radio APs use index 3 for Slot A and index 4 for Slot B.

```
[Device Name]>set secconfigtbl <index> authmode <none, 802.1x,
              mixed, wpa, wpa-psk>
[Device Name]>set secconfigtbl <index> enckeylen <64bits,
              128bits>
[Device Name]>set secconfigtbl <index> rekeyint <60 – 65535
              seconds; default is 900 sec>
```

`[Device Name]>`**`show secconfigtbl`** (to review your settings)
`[Device Name]>`**`reboot 0`**

NOTE:
If you set Authentication Mode to 802.1x, WPA, or Mixed, you also need to configure the RADIUS Authentication parameters. If you set Authentication Mode to Mixed, you also need to configure WEP Encryption settings.

For Dual-radio APs: WPA is available for APs with an 11a Upgrade Kit or 802.11b/g Kit. WPA is NOT available for APs with an 802.11b PC Card or a 5 GHz Upgrade Kit.

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Set Pre-Shared Key (WPA-PSK Mode)

```
[Device Name]>set wpaconfigtbl <index> pskey <64 hexadecimal
digits>
```

or

```
[Device Name]>set wpaconfigtbl <index> passphrase <8-64
characters; a minimum of 13 characters is recommended>

[Device Name]>show wpaconfigtbl (to review your settings)
[Device Name]>reboot 0
```

Set RADIUS Parameters

Configure RADIUS Authentication server

```
[Device Name]>set radiustbl <index> status enable seraddrfmt
              <ipaddr or name> ipaddr <RADIUS IP address or
              name> port <user defined> ssecret <user defined>
              responsetm <1 to 4 seconds> maxretx <1 to 10
              times>
[Device Name]>show radiustbl
```


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Figure A-17. Results of "show radiustbl" CLI command

```
[Device Name]> show radiustbl
RADIUS Authentication Group Table
=========================
Index                    :              1
RADIUS Auth Server Status:       disable
IP Address/Host Name     :       0.0.0.0
Authentication Port      :          1812
Response Time            :             3
Shared Secret            :       ******
Server Addressing Format:          ipaddr
Maximum Retransmission   :             3

Index                    :              2
RADIUS Auth Server Status:       disable
IP Address/Host Name     :       0.0.0.0
Authentication Port      :          1812
Response Time            :             3
Shared Secret            :       ******
Server Addressing Format:          ipaddr
Maximum Retransmission   :             3
```

Enable RADIUS MAC Access Control

[Device Name]>**set radmacaccctrl enable**

[Device Name]>**reboot 0**

Set MAC Address Format Type

[Device Name]>**set radmacaddrformat <dashdelimited, colondelimited, singledashdelimited, nodelimiter>**

Set Authorization Lifetime

[Device Name]>**set radauthlifetm <900-43200 seconds; default is 900>**

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Enable RADIUS Accounting

```
[Device Name]>set radaccstatus enable
[Device Name]>set radaccinactivetmr <inactivity timer in
minutes>
[Device Name]>show radius
```

Figure A-18. Result of "show radius" CLI Command

```
[Device Name]> show radius
RADIUS Group

RADIUS Authentication
====================
radcliinvsvraddr                :       0
radmacaccctrl                   :       disable
radauthlifetm                   :       900
radmacaddrformat                :       dashdelimited

RADIUS Accounting
================
radaccstatus                    :       disable
radaccinactivetmr               :       5
```


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Configure RADIUS Accounting server

```
[Device Name]>set radacctbl <index> status <enable> seraddrfmt
<ipaddr or name> ipaddr <RADIUS IP address or name> port <user
defined> ssecret <user defined> responsetm <1 to 4 seconds>
maxretx <1 to 10 times>
[Device Name]>show radacctbl
```

Figure A-19. Results of "show radacctbl" CLI command

```
[Device Name]> show radacctbl
RADIUS Accounting Group Table

=======================
Index                    :            1
RADIUS Acc Server Status :      disable
IP Address/Host Name     :      0.0.0.0
Accounting Port          :         1813
Response Time            :            3
Shared Secret            :       ******
Server Addressing Format :       ipaddr
Maximum Retransmission   :            3

Index                    :            2
RADIUS Acc Server Status :      disable
IP Address/Host Name     :      0.0.0.0
Accounting Port          :         1813
Response Time            :            3
Shared Secret            :       ******
Server Addressing Format :       ipaddr
Maximum Retransmission   :            3
```

Set VLAN/SSID Parameters

NOTE:

For Dual-radio APs: APs with an 11a Upgrade Kit or 802.11b/g Kit support up to 16 VLAN/SSID pairs. APs with an 802.11b PC Card or a 5 GHz Upgrade Kit support only one VLAN/SSID per radio.

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Enable VLAN Management

```
[Device Name]>set vlanstatus enable
[Device Name]>set vlanmgmtid <1-4094>

[Device Name]>show vlandidtbl (to review your settings)
[Device Name]>reboot 0
```

Disable VLAN Management

```
[Device Name]>set vlanstatus disable or
[Device Name]>set vlanmgmtid 0
[Device Name]>reboot 0
```

Add an Entry to the VLAN ID Table

```
[Device Name]>set vlanidtbl <index number; see table> id
<1-4094, -1=untagged> ssid <enter network name>

[Device Name]>show vlandidtbl (to review your settings)
[Device Name]>reboot 0
```


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CLI Monitoring Parameters

Using the **show** command with the following table parameters will display operating statistics for the AP (these are the same statistics that are described in Monitor Information for the HTTP Web interface).

— **staticmp:** Displays the ICMP Statistics.

— **statarptbl:** Displays the IP ARP Table Statistics.

— **statbridgetbl:** Displays the Learn Table.

— **statiapp:** Displays the IAPP Statistics.

— **statradius:** Displays the RADIUS Authentication Statistics.

— **statif:** Displays information and statistics about the Ethernet and wireless interfaces.

— **stat802.11:** Displays additional statistics for the wireless interfaces.

— **statethernet:** Displays additional statistics for the Ethernet interface.

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Parameter Tables

Objects contain groups that contain both parameters and parameter tables. Use the following Tables to configure the Access Point. Columns used on the tables include:

- **Name** - Parameter, Group, or Table Name
- **Type** - Data type
- **Values** - Value range, and default value, if any
- **Access** = access type, **R** = Read Only (show), **RW** = Read-Write (can be “set”), **W** = Write Only
- **CLI Parameter** - Parameter name as used in the Access Point

Access Point network objects are associated with Groups. The network objects are listed below and associated parameters are described in the following Parameter Tables:

- System Parameters - Access Point system information
- Inventory Management Information - Hardware, firmware, and software version information
- Network Parameters - IP and Network Settings
  - — IP Configuration Parameters - Configure the Access Point’s IP settings
  - — DNS Client for RADIUS Name Resolution - Configure the Access Point as a DNS client

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  - — DHCP Server Parameters - Enable or disable dynamic host configuration
  - — Link Integrity Parameters - Monitor link status
- Interface Parameters - Configure Wireless and Ethernet settings
  - — Wireless Interface Parameters
  - — Wireless Distribution System (WDS) Parameters (802.11b Only) - Configure the WDS partnerships
  - — Ethernet Interface Parameters - Set the speed and duplex of the Ethernet port
- Management Parameters - Control access to the AP's management interfaces
  - — SNMP Parameters - Set read and read/write passwords
  - — HTTP (web browser) Parameters - Set up the graphical web browser interface
  - — Telnet Parameters - Telnet Port setup
  - — Serial Port Parameters - Serial Port setup
  - — TFTP Server Parameters - Set up for file transfers; specify IP Address, file name, and file type
  - — IP Access Table Parameters - Configure range of IP addresses that can access the AP
- Filtering Parameters
  - — Ethernet Protocol Filtering Parameters - Control network traffic based on protocol type

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— Static MAC Address Filter Table - Enable and disable specific addresses

— Proxy ARP Parameters - Enable or disable proxy ARP for wireless clients

— IP ARP Filtering Parameters - Control which ARP messages are sent to wireless clients based on IP settings

— Broadcast Filtering Table - Control the type of broadcast packets forwarded to the wireless network

— TCP/UDP Port Filtering - Filter IP packets based on TCP/UDP port

- Alarms Parameters

  — SNMP Table Host Table Parameters - Enter the list of IP addresses that will receive alarms from the AP

  — Syslog Parameters - Configure the AP to send Syslog information to network servers

- Bridge Parameters

  — Spanning Tree Parameters - Used to help prevent network loops

  — Storm Threshold Parameters - Set threshold for number of broadcast packets

  — Intra BSS Subscriber Blocking - Enable or disable peer to peer traffic on the same AP

  — Packet Forwarding Parameters - Redirect traffic from wireless clients to a specified MAC address

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- Security Parameters - Access Point security settings
  - — Wireless Interface Security Parameters - Configure WEP encryption settings
  - — MAC Access Control Parameter - Control wireless access based on MAC address
- RADIUS Parameters
  - — Primary and Backup RADIUS Server Table Parameters - RADIUS Authentication and Accounting information
- VLAN/SSID Parameters - Configure mutiple subnetworks based on VLAN ID and SSID pairs.
- Other Parameters
  - — IAPP Parameters - Enable or disable the Inter-Access Point Protocol
  - — SpectraLink VoIP Parameters (802.11b Only) - Enable or disable SpectraLink Voice over IP feature

System Parameters

Name	Type	Values	Access	CLI Parameter
System	Group	N/A	R	system
Name	DisplayString	User Defined	RW	sysname
Location	DisplayString	User Defined	RW	sysloc
Contact Name	Display String	User Defined	RW	sysctname
Contact E-mail	Display String	User Defined	RW	sysctemail

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Contact Phone	Display String	User Defined Maximum 254 characters	RW	sysctphone
FLASH Backup Interval	Integer	0 - 65535 seconds	RW	sysflashbckint
Flash Update		0 1	RW	sysflashupdate
System OID	DisplayString	N/A	R	sysoid
Descriptor	DisplayString	System Name, flash version, S/N, bootloader version	R	sysdescr
Up Time	Integer	dd:hh:mm:ss dd – days hh – hours mm – minutes ss – seconds	R	sysuptime
Emergency Restore to defaults		Resets all parameters to default factory values	RW	sysresettodefaults Note: You must enter the following command twice to reset to defaults: **set sysresettodefaults 1**

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Inventory Management Information

Name	Type	Values	Access	CLI Parameter
System Inventory Management	Subgroup	N/A	R	sysinvmgmt
Component Table	Subgroup	N/A	R	sysinvmgmtcmptbl
Component Interface Table	Subgroup	N/A	R	sysinvmgmtcmpiftbl

NOTE:
The inventory management commands display advanced information about the AP's installed components. You may be asked to report this information to a representative if you contact customer support.

Network Parameters

IP Configuration Parameters

Name	Type	Values	Access	CLI Parameter
Network	Group	N/A	R	network
IP Configuration	Group	N/A	R	ip (Note: The **network** and **ip** parameters display the same information)
IP Address	IpAddress	User Defined	RW	ipaddr
IP Mask	IpAddress	User Defined	RW	ipmask

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Default Router IP Address	IpAddress	User Defined	RW	ipgw
Default TTL	Integer	User Defined (seconds) 64 (default)	RW	ipttl
Address Type	Integer	static dynamic (default)	RW	ipaddrtype

NOTE:
The IP Address Assignment Type (ipaddrtype) must be set to static before the IP Address (ipaddr), IP Mask (ipmask) or Default Gateway IP Address (ipgw) values can be entered.

DNS Client for RADIUS Name Resolution

Name	Type	Values	Access	CLI Parameter
DNS Client	Group	N/A	R	dns
DNS Client status	Integer	enable disable (default)	RW	dnsstatus
Primary DNS Server IP Address	IpAddress	User Defined	RW	dnspridnsipaddr
Secondary DNS Server IP Address	IpAddress	User Defined	RW	dnssecdnsipaddr
Default Domain Name	Integer32	User Defined (up to 254 characters)	RW	dnsdomainname

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DHCP Server Parameters

Name	Type	Values	Access	CLI Parameter
DHCP Server	Group	N/A	R	dhcp
DHCP Server Status	Integer	enable (1) (default) disable (2) delete (3)	RW	dhcpstatus
Gateway IP Address	IpAddress	User Defined	RW	dhcpgw
Primary DNS IP Address	IpAddress	User Defined	RW	dhcppridnsipaddr
Secondary DNS IP Address	IpAddress	User Defined	RW	dhcpsecdnsipaddr
Number of IP Pool Table Entries	Integer32	N/A	R	dhcpippooltblent

NOTE:
The DHCP Server (dhcpstatus) can only be enabled after a DHCP IP Pool table entry has been created.

DHCP Server table for IP pools

Name	Type	Values	Access	CLI Parameter
DHCP Server IP Address Pool Table	Table	N/A	R	dhcpippooltbl
Table Index	Integer	User Defined	N/A	index
Start IP Address	IpAddress	User Defined	RW	startipaddr
End IP Address	IpAddress	User Defined	RW	endipaddr
Width	Integer	User Defined	RW	width

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Default Lease Time (optional)	Integer32	> 0 86400 sec (default)	RW	defleasetm
Maximum Lease Time (optional)	Integer32	> 0 86400 sec (default)	RW	maxleasetm
Comment (optional)	DisplayString	User Defined	RW	cmt
Status (optional)	Integer	enable (1) disable (2) delete (3)	RW	status

NOTE:
Set either End IP Address or Width (but not both) when creating an IP address pool.

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Link Integrity Parameters

Name	Type	Values	Access	CLI Parameter
Link Integrity	Group	N/A	R	linkint
Link Integrity Status	Integer	enable disable (default)	RW	linkintstatus
Link Integrity Poll Interval	Integer	500 - 15000 ms (in increments of 500ms) 500 ms (default)	RW	linkintpollint
Link Integrity Poll Retransmissions	Integer	0 - 255 5 (default)	RW	linkintpollretx

Link Integrity IP Target Table

Name	Type	Values	Access	CLI Parameter
Link Integrity IP Target Table	Table	N/A	R	linkinttbl
Table Index	Integer	1-5	N/A	index
Target IP Address	IpAddress	User Defined	RW	ipaddr
Comment (optional)	DisplayString	User Defined (up to 254 characters)	RW	cmt
Status (optional)	Integer	enable disable (default) delete	RW	status

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Interface Parameters

Wireless Interface Parameters

The wireless interface group parameter is **wif**. For Single-radio APs, the wireless interface uses table index 3. For Dual-radio APs, Slot A uses table index 3 and Slot B uses table index 4.

Common Parameters to 802.11a, 802.11b, and 802.11b/g APs

Name	Type	Values	Access	CLI Parameter
Wireless Interfaces	Group	N/A	R	wif
Table Index	Integer	3 or 4 (Dual-radio APs)	R	index
Network Name	DisplayString	1 – 32 characters My Wireless Network (default)	RW	netname
Auto Channel Select (ACS)[1]	Integer	enable (default) disable	RW	autochannel
DTIM Period	Integer	1 – 255 1 = default	RW	dtimperiod
RTS/CTS Medium Reservation	Integer	0 – 2347 Default is 2347 (off)	RW	medres
MAC Address	PhyAddress	12 hex digits	R	macaddr
Closed System	Integer	enable disable (default)	RW	closedsys
Supported Frequency Channels	Octet String	Depends on Regulatory Domain	R	suppchannels

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Note 1: For 802.11a APs in Europe, Auto Channel Select is a read-only parameter; it is always enabled.

802.11a Only Parameters

Name	Type	Values	Access	CLI Parameter
Operating Frequency Channel	Integer	Varies by regulatory domain and country. See 802.11a Channel Frequencies	RW	channel
Supported Data Rates	Octet String	See Transmit Rate, below	R	suppdatarates
Transmit Rate	Integer32	0 - Auto Fallback (default) 6 Mbits/sec 9 Mbits/sec 12 Mbits/sec 18 Mbits/sec 24 Mbits/sec 36 Mbits/sec 48 Mbits/sec 54 Mbits/sec	RW	txrate
Physical Layer Type	Integer	ofdm (orthogonal frequency division multiplexing) for 802.11a	R	phytype

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802.11b Only Parameters

Name	Type	Values	Access	CLI Parameter
Distance between APs	Integer	large (default) medium small minicell microcell	RW	distaps
Interference Robustness	Integer	enable (default) disable	RW	interrobust
Operating Frequency Channel	Integer	1 - 14; available channels vary by regulatory domain/country; see 802.11b Channel Frequencies	RW	channel
Multicast Rate	Integer	1 Mbits/sec (1) 2 Mbits/sec (2) (default) 5.5 Mbits/sec (3) 11 Mbits/sec (4)	RW	multrate
Closed Wireless System	Integer	enable disable (default)	RW	closedsys
Load Balancing	Integer	enable (default) disable	RW	ldbalance

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Name	Type	Values	Access	CLI Parameter
Medium Distribution	Integer	enable (default) disable	RW	meddendistrib
MAC Address	PhyAddress	12 hex digits	R	macaddr
Supported Data Rates	Octet String	1 Mbits/sec 2 Mbits/sec 5.5 Mbits/sec 11 Mbits/sec	R	suppdatarates
Transmit Rate	Integer32	0 (auto fallback - default) 1 Mbits/sec 2 Mbits/sec 5.5 Mbits/sec 11 Mbits/sec	RW	txrate
Supported Frequency Channels	Octet String	Depends on Regulatory Domain	R	suppchannels
Physical Layer Type	Integer	dsss (direct sequence spread spectrum) for 802.11b	R	phytype
Regulatory Domain List	DisplayString	U.S./Canada -- FCC Europe -- ETSI Japan -- MKK	R	regdomain

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NOTE:
There is an inter-dependent relationship between the Distance between APs and the Multicast Rate. In general, larger systems operate a lower average transmit rates.

Distance between APs	**Multicast Rate**
Large	1 and 2 Mbits/sec
Medium	1, 2, and 5.5 Mbits/sec
Small	1, 2, 5.5 and 11 Mbits/sec
Minicell	1, 2, 5.5 and 11 Mbits/sec
Microcell	1, 2, 5.5 and 11 Mbits/sec

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802.11b/g Only Parameters

Name	Type	Values	Access	CLI Parameter
Wireless Operational Mode	Integer	dot11b-only dot11g-only dot11bg (default) dot11g-wifi	RW	mode
Operating Frequency Channel	Integer	1 - 14; available channels vary by regulatory domain/country; see 802.11g Channel Frequencies	RW	channel
Supported Data Rates	Octet String	See Transmit Rate, next.	R	suppdatarates

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Name	Type	Values	Access	CLI Parameter
Transmit Rate	Integer32	For 802.11b-only mode: 0 (auto fallback - default) 1 Mbits/sec 2 Mbits/sec 5.5 Mbits/sec 11 Mbits/sec For 802.11g-only mode: 0 (auto fallback - default) 6 Mbits/sec 9 Mbits/sec 12 Mbits/sec 18 Mbits/sec 24 Mbits/sec 36 Mbits/sec 48 Mbits/sec 54 Mbits/sec 36 Mbits/sec 48 Mbits/sec 54 Mbits/sec	RW	txrate

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Name	Type	Values	Access	CLI Parameter
Transmit Rate (continued)	Integer32	For 802.11g-wifi and 802.11bg modes: 0 (auto fallback - default) 1 Mbits/sec 2 Mbits/sec 5.5 Mbits/sec 11 Mbits/sec 6 Mbits/sec 9 Mbits/sec 12 Mbits/sec 18 Mbits/sec 24 Mbits/sec	RW	txrate
Physical Layer Type	Integer	ERP (Extended Rate Protocol)	R	phytype

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Wireless Distribution System (WDS) Parameters (802.11b Only)

NOTE:
At this time, WDS is not available for an 802.11a or 802.11b/g AP.

Name	Type	Values	Access	CLI Parameter
WDS Table	Table	N/A	R	wdstbl
Port Index	Integer	3.1 - 3.6 (Wireless)	R	portindex
Status	Integer	enable, disable	RW	status
Partner MAC Address	PhysAddress	User Defined	RW	partnermacaddr

Ethernet Interface Parameters

Name	Type	Values	Access	CLI Parameter
Ethernet Interface	Group	N/A	R	ethernet
Speed	Integer	10halfduplex 10fullduplex 10autoduplex 100halfduplex 100fullduplex autohalfduplex autoautoduplex (default)	RW	etherspeed
MAC Address	PhyAddress	N/A	R	ethermacaddr

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Management Parameters

SNMP Parameters

Name	Type	Values	Access	CLI Parameter
SNMP	Group	N/A	R	snmp
SNMP Management Interface Bitmask	Interface Bitmask	0 or 2 - no interfaces (disable) 1 or 3 - Ethernet 4 or 6 - Wireless A 8 or 10 - Wireless B 12 = Wireless A & B 13 or 15 - all interfaces (default is 15)	RW	snmpifbitmask
Read Password	DisplayString	User Defined public (default) max 63 characters	W	snmprpasswd
Read/Write Password	DisplayString	User Defined public (default) max 63 characters	W	snmprwpasswd

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HTTP (web browser) Parameters

Name	Type	Values	Access	CLI Parameter
HTTP	Group	N/A	R	http
HTTP Management Interface Bitmask	Interface Bitmask	0 or 2 - no interfaces (disable) 1 or 3 - Ethernet 4 or 6 - Wireless A 8 or 10 - Wireless B 12 = Wireless A & B 13 or 15 - all interfaces (default is 15)	RW	httpifbitmask
HTTP Password	DisplayString	User Defined max 64 characters	W	httppasswd
HTTP Port	Integer	User Defined Default = 80	RW	httpport
Help Link	DisplayString	User Defined	RW	httphelplink

NOTE:
The default path for the Help files is **C:/Program Files/Avaya_ Wireless/AP/HTML/index.htm**. (Use the forward slash character ("/") rather than the backslash character ("\") when configuring the **Help Link** location.) The AP Help information is available in English, French, German, Italian, Spanish, and Japanese.

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Telnet Parameters

Name	Type	Values	Access	CLI Parameter
Telnet	Group	N/A	R	telnet
Telnet Management Interface Bitmask	Interface Bitmask	0 or 2 - no interfaces (disable) 1 or 3 - Ethernet 4 or 6 - Wireless A 8 or 10 - Wireless B 12 = Wireless A & B 13 or 15 - all interfaces (default is 15)	RW	telifbitmask
Telnet Port	Integer	User Defined 23 (default)	RW	telport
Telnet Login Inactivity Time-out	Integer	1 – 300 seconds 30 sec (default)	RW	tellogintout
Telnet Session Idle Time-out	Integer	1 - 900 seconds 900 sec (default)	RW	telsessiontout

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Serial Port Parameters

Name	Type	Values	Access	CLI Parameter
Serial	Group	N/A	R	serial
Baud Rate	Integer	2400, 4800, 9600 (default), 19200, 38400, 57600	RW	serbaudrate
Data Bits	Integer	8	R	serdatabits
Parity	Integer	none	R	serparity
Stop Bits	Integer	1	R	serstopbits
Flow Control	Value	none (default) xonxoff	RW	serflowctrl

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TFTP Server Parameters

These parameters relate to upload and download commands.

When a user executes an upload and/or download Command, the specified arguments are stored in TFTP parameters for future use. If nothing is specified in the command line when issuing subsequent upload and/or download commands, the stored arguments are used.

Name	Type	Values	Access	CLI Parameter
TFTP	Group	N/A	R	tftp
TFTP Server IP Address	IpAddress	User Defined	RW	tftpipaddr
TFTP File Name	DisplayString	User Defined	RW	tftpfilename
TFTP File Type	Integer	img config bootloader	RW	tftpfiletype

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IP Access Table Parameters

When creating table entries, you may either specify the argument name followed by argument value or simply entering the argument value. When only the argument value is specified, then enter the values in the order depicted by the following table. CLI applies default values to the omitted arguments. Due to the nature of the information, the only argument that can be omitted is the “comment” argument.

Name	Type	Values	Access	CLI Parameter
IP Access Table	Table	N/A	R	mgmtipaccesstbl
Table Index	Integer	User Defined	N/A	index
IP Address	IpAddress	User Defined	RW	ipaddr
IP Mask	IpAddress	User Defined	RW	ipmask
Comment (optional)	DisplayString	User Defined	RW	cmt
Status (optional)	Integer	enable (default) disable delete	RW	status

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Filtering Parameters

Ethernet Protocol Filtering Parameters

Name	Type	Values	Access	CLI Parameter
Ethernet Filtering	Group	N/A	R	etherflt
Filtering Interface Bitmask	Interface Bitmask	0 or 2 - no interfaces (disable) 1 or 3 - Ethernet 4 or 6 - Wireless A 8 or 10 - Wireless B 12 = Wireless A & B 13 or 15 - all interfaces (default is 15)	RW	etherfltifbitmask
Operation Type		passthru block	RW	etherfltoptype

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Ethernet Filtering Table

Identify the different filters by using the table index.

Name	Type	Values	Access	CLI Parameter
Ethernet Filtering Table	Table	N/A	R	etherflttbl
Table Index	N/A	N/A	R	index
Protocol Number	Octet String	N/A	RW	protonumber
Protocol Name (optional)	DisplayString		RW	protoname
Status (optional)	Integer	enable (1) disable (2) delete (3)	RW	status

NOTE:
The filter Operation Type (passthru or block) applies **only** to the protocol filters that are **enabled** in this table.

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Static MAC Address Filter Table

Name	Type	Values	Access	CLI Parameter
Static MAC Address Filter Table	Table	N/A	R	staticmactbl
Table Index	N/A	N/A	R	index
Static MAC Address on Wired Network	PhysAddress	User Defined	RW	wiredmacaddr
Static MAC Address Mask on Wired Network	PhysAddress	User Defined	RW	wiredmask
Static MAC Address on Wireless Network	PhysAddress	User Defined	RW	wirelessmacaddr
Static MAC Address Mask on Wireless Network	PhysAddress	User Defined	RW	wirelessmask
Comment (optional)	DisplayString	max 255 characters	RW	cmt
Status (optional)	Integer	enable (default) disable delete	RW	status

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Proxy ARP Parameters

Name	Type	Values	Access	CLI Parameter
Proxy ARP	Group	N/A	R	parp
Status	Integer	enable disable (default)	RW	parpstatus

IP ARP Filtering Parameters

Name	Type	Values	Access	CLI Parameter
IP ARP Filtering	Group	N/A	R	iparp
Status	Integer	enable disable (default)	RW	iparpfltstatus
IP Address	IpAddress	User Defined	RW	iparpfltipaddr
Subnet Mask	IpAddress	User Defined	RW	iparpfltsubmask

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Broadcast Filtering Table

Name	Type	Values	Access	CLI Parameter
Broadcast Filtering Table	Table	N/A	R	broadcastflttbl
Index	Integer	1-5	N/A	index
Protocol Name	DisplayString	N/A	R	protoname
Direction	Integer	ethertowireless wirelesstoether both (default)	RW	direction
Status	Integer	enable disable (default)	RW	status

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TCP/UDP Port Filtering

The following parameters are used to enable/disable the Port filter feature.

Name	Type	Values	Access	CLI
Port Filtering	Group	N/A	R	portflt
Port Filter Status	Integer	enable (default) disable	RW	portfltstatus

TCP/UDP Port Filtering Table

The following parameters are used to configure TCP/UDP Port filters.

Name	Type	Values	Access	CLI
Port Filtering Table	Table	N/A	R	portflttbl
Table Index	N/A	User Defined (there are also 4 pre-defined indices, see Port Number in this table for more information)	R	index
Port Type	Octet String	tcp udp tcp/udp	RW	porttype

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Port Number	Octet String	User Defined (there are also 4 pre-defined protocols: Index 1: NetBios Name Service – 137, Index 2: NetBios Datagram Service – 138, Index 3: NetBios Session Service – 139, Index 4: SNMP Service – 161)	RW	portnum
Protocol Name	DisplayString	User Defined (there are also 4 pre-defined protocols, see Port Number above)	RW	protoname

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Interface Bitmask	Integer32	0 or 2 - no interfaces (disable) 1 or 3 - Ethernet 4 or 6 - Wireless A 8 or 10 - Wireless B 12 = Wireless A & B 13 or 15 - all interfaces (default is 15)	RW	ifbitmask
Status (optional)	Integer	enable (default for new entries) disable (default for pre-defined entries) delete	RW	status

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Alarms Parameters

SNMP Table Host Table Parameters

When creating table entries, you may either specifying the argument name followed by argument value. CLI applies default values to the omitted arguments. Due to the nature of the information, the only argument that can be omitted is the “comment” argument.

Name	Type	Values	Access	CLI Parameter
SNMP Trap Host Table	Table	N/A	R	snmptraphosttbl
Table Index	Integer	User Defined	N/A	index
IP Address	IpAddress	User Defined	RW	ipaddr
Password	DisplayString	User Defined (up to 64 characters)	W	passwd
Comment (optional)	DisplayString	User Defined (up to 254 characters)	RW	cmt
Status (optional)	Integer	enable (default) disable delete	RW	status

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Syslog Parameters

The following parameters configure the Syslog settings.

Name	Type	Values	Access	CLI
Syslog	Group	N/A	R	syslog
Syslog Status	Integer	enable disable (default)	RW	syslogstatus
Syslog Port	Octet String	514	R	syslogport
Syslog Lowest Priority Logged	Integer	1 – 7 1 = LOG_ALERT 2 = LOG_CRIT 3 = LOG_ERR 4 = LOG_ WARNING 5 = LOG_NOTICE 6 = LOG_INFO (default) 7 = LOG_DEBUG	RW	syslogpritolog
Heartbeat Status	Integer	enable (1) disable (2) (default)	RW	sysloghbstatus
Heartbeat Interval (seconds)	Integer	1 – 604800 seconds; 900 sec. (default)	RW	sysloghbinterval

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NOTE:
The Heartbeat parameters are advanced settings not available via the HTTP interface. When Heartbeat is enabled, the AP periodically sends a message to the Syslog server to indicate that it is active. The frequency with which the heartbeat message is sent depends upon the setting of the Heartbeat Interval.

Syslog Host Table

The table described below configures the Syslog hosts that will receive message from the AP. You can configure up to ten Syslog hosts.

Name	Type	Values	Access	CLI Parameter
Syslog Host Table	Table	N/A	R	sysloghosttbl
Table Index	Integer	1 – 10	N/A	index
IP Address	IpAddress	User Defined	RW	ipaddr
Comment (optional)	DisplayString	User Defined	RW	cmt
Status (optional)	Integer	enable disable delete	RW	status

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Bridge Parameters

Spanning Tree Parameters

Name	Type	Values	Access	CLI Parameter
Spanning Tree	Group	N/A	R	stp
Spanning Tree Status	Integer	enable disable (default)	RW	stpstatus
Bridge Priority	Integer	0 – 65535 32768 (default)	RW	stppriority
Maximum Age	Integer	600 – 4000 (in 0.01 sec intervals; i.e., 6 to 40 seconds) 2000 (default)	RW	stpmaxage
Hello Time	Integer	100 – 1000 (in 0.01 sec intervals; i.e., 1 to 10 seconds) 200 (default)	RW	stphellotime
Forward Delay	Integer	400 – 3000 (in 0.01 sec intervals; i.e., 4 to 30 seconds) 1500 (default)	RW	stpfwddelay

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Spanning Tree Priority and Path Cost Table

Name	Type	Values	Access	CLI Parameter
Spanning Tree Table	Table	N/A	R	stpbl
Table Index (Port)	N/A	1 – 15	R	index
Priority	Integer	0 – 255 128 (default)	RW	priority
Path Cost	Integer	1 – 65535 100 (default)	RW	pathcost
State	Integer	disable blocking listening learning forwarding broken	R	state
Status	Integer	enable disable	RW	status

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Storm Threshold Parameters

Name	Type	Values	Access	CLI Parameter
Storm Threshold	Group	N/A	N/A	stmthres
Broadcast Threshold	Integer	0 – 255 packets/sec (default is 0)	RW	stmbrdthres
Multicast Threshold	Integer	0 – 255 packets/sec (default is 0)	RW	stmmultithres

Storm Threshold Table

Name	Type	Values	Access	CLI Parameter
Storm Threshold Table	Table	N/A	R	stmthrestbl
Table Index	Integer	1 = Ethernet 3 = Wireless	R	index
Broadcast Threshold	Integer	0 – 255 packets/sec (default is 0)	RW	bcast
Multicast Threshold	Integer	0 – 255 packets/sec (default is 0)	RW	mcast

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Intra BSS Subscriber Blocking

The following parameters control the Intra BSS traffic feature, which prevent wireless clients that are associated with the same AP from communicating with each other:

Name	Type	Values	Access	CLI
Intra BSS Traffic	Group	N/A	R	intrabss
Intra BSS Traffic Operation	Integer	passthru (default) block	RW	intrabssoptype

Packet Forwarding Parameters

The following parameters control the Packet Forwarding feature, which redirects wireless traffic to a specific MAC address:

Name	Type	Values	Access	CLI
Packet Forwarding MAC Address	Group	N/A	R	pktfwd
Packet Forwarding MAC Address	MacAddress	User Defined	RW	pktfwdmacaddr
Packet Forwarding Status	Integer	enable disable (default)	RW	pktfwdstatus

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Packet Forwarding Interface Port	Integer	0 (any) (default) 1 (Ethernet) 2 (WDS 1) 3 (WDS 2) 4 (WDS 3) 5 (WDS 4) 6 (WDS 5) 7 (WDS 6)	RW	pktfwdif

NOTE:
The Wireless Distribution System (WDS) feature is not available for 802.11a or 802.11b/g APs at this time.

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Security Parameters

NOTE:
For Dual-radio APs: WPA is available for APs with an 11a Upgrade Kit or 802.11b/g Kit. WPA is NOT available for APs with an 802.11b PC Card or a 5 GHz Upgrade Kit.

Name	Type	Values	Access	CLI Parameter
Security	Table	N/A	R	secconfigtbl
Index	Integer	3 (Single-radio APs) 3 or 4 (Dual-radio APs)	R	index
Authentication Mode	Integer	none (default) 802.1x mixed wpa wpa-psk	RW	authmode
Re-keying Interval	Integer	60 – 65535 seconds default is 900 sec	RW	rekeyint
Encryption Key Length	Integer	64bits 128bits	RW	enckeylen

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Pre-Shared Key Configuration Table (WPA-PSK Mode)

Name	Type	Values	Access	CLI Parameter
WPA-PSK Pre-Shared Key Table	Table	N/A	R	wpaconfigtbl
Index	Integer	3 (Slot A) or 4 (Slot B)	N/A	index
Pre-Shared Key[1]	DisplayString	64 hex digits	WO	pskey
PSK Pass Phrase[1]	DisplayString	8 to 64 characters[2]	WO	passphrase

Note 1: Configure either the **Pre-Shared Key** or the **PSK Pass Phrase** (but not both) to create a pre-shared key for WPA-PSK mode. Setting **Pre-Shared Key** will override a previous **PSK Pass Phrase** setting. Similarly, setting **PSK Pass Phrase** will override a previous **Pre-Shared Key** setting.

Note 2: Avaya recommends using a **PSK Pass Phrase** of at least 13 characters to ensure that the generated key cannot be easily deciphered by network infiltrators.

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Wireless Interface Security Parameters

The following table details the WEP encryption parameters for the AP.

Name	Type	Values	Access	CLI Parameter
Wireless Interface Security	Group		R	wifsec
Encryption Status	Integer	enable, disable (default)	RW	encryptstatus
Index	Integer	3 (Single-radio APs) 3 or 4 (Dual-radio APs)	R	index
Encryption Key 1	DisplayString	User Defined	W	encryptkey1
Encryption Key 2	DisplayString	User Defined	W	encryptkey2
Encryption Key 3	DisplayString	User Defined	W	encryptkey3
Encryption Key 4	DisplayString	User Defined	W	encryptkey4
Data Transmission Encryption Key	Integer	key1 (default), key2, key3, key4	RW	encryptkeytx

NOTE:
See WEP Encryption for information on the supported WEP Key lengths.

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Security Encryption Key Length Table

The following table details how to set the Encryption Key Length for the wireless interfaces.

Name	Type	Values	Access	CLI Parameter
Security Encryption Key Length Table	Table	N/A	R	secenckeylentbl
Index	Integer	3 (Single-radio APs) 3 or 4 (Dual-radio APs)	N/A	index
Encryption Key Length	Integer	64bits 128bits	RW	enckeylen

MAC Access Control Parameter

Name	Type	Values	Access	CLI Parameter
MAC Address Control	Group	N/A	R	macacl
Status	Integer	enable disable (default)	RW	macaclstatus
Operation Type	Integer	passthru (default) block	RW	macacloptype

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MAC Access Control Table

Name	Type	Values	Access	CLI Parameter
MAC Address Control Table	Table	N/A	R	macacltbl
Table Index	N/A	N/A	R	index
MAC Address	PhysAddress	User Defined	RW	macaddr
Comment (optional)	DisplayString	User Defined max 254 characters	RW	cmt
Status (optional)	Integer	enable (default) disable delete	RW	status

RADIUS Parameters

Primary and Backup RADIUS Server Table Parameters

Avaya Wireless devices that use RADIUS authentication and/or accounting support both primary and backup RADIUS servers. The configuration parameters and statistics are the same for both primary and backup servers. The CLI differentiates the primary and backup RADIUS parameters by using the table index.

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General RADIUS Parameters

Name	Type	Values	Access	CLI Parameter
RADIUS	Group	N/A	R	radius
MAC Access Control Status	Integer	enable disable (default)	R	radmacacctrl
Authorization Lifetime	Integer32	900 – 43200 seconds 900 sec. (default)	RW	radauthlifetm
MAC Address Format	Integer	dashdelimited (default) colondelimited singledashdelimited no delimiter	RW	radmacaddrformat
RADIUS Accounting Status	Integer	enable disable (default)	RW	radaccstatus
Accounting Inactivity Timer	Integer32	0 – 2147483647 minutes; default is 5 min.	RW	radaccinactivetmr

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RADIUS Authentication

NOTE:
Use a server name only if you have enabled the DNS Client functionality. See DNS Client for RADIUS Name Resolution.

Name	Type	Values	Access	CLI Parameter
RADIUS Authentication	Table	N/A	R	radiustbl
Primary RADIUS	Integer	1	R	index
Backup RADIUS	Integer	2	R	index
RADIUS Server Status	Integer	enable disable (default)	RW	status
Server Addressing Format (see note)	Integer	ipaddr (default) name	RW	seraddrfmt
Server IP Address or Name	IpAddress DisplayString	User Defined (enter an IP address if seraddrfmt is ipaddr or a name if set to name; up to 254 characters if using a name)	RW	ipaddr
Port (optional)	Integer	User Defined 1812 (default)	RW	port
Shared Secret	DisplayString	User Defined max 63 characters	W	ssecret
Response Time (sec)	Integer	1 – 4 seconds 3 sec (default)	RW	responsetm

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Maximum Retransmissions (optional)	Integer	1 – 10 3 (default)	RW	maxretx

RADIUS Accounting

NOTE:
Use a server name only if you have enabled the DNS Client functionality. See DNS Client for RADIUS Name Resolution.

Name	Type	Values	Access	CLI Parameter
RADIUS Accounting	Table	N/A	R	radacctbl
Primary RADIUS	Integer	1	R	index
Backup RADIUS	Integer	2	R	index
RADIUS Server Status	Integer	enable disable (default)	RW	status
Server Addressing Format (see note)	Integer	ipaddr (default) name	RW	seraddrfmt
Server IP Address or Name	IpAddress Display String	User Defined (enter an IP address if seraddrfmt is ipaddr or a name if set to name; up to 254 characters if using a name)	RW	ipaddr
Port (optional)	Integer	User Defined 1813 (default)	RW	port

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Name	Type	Values	Access	CLI Parameter
Shared Secret	DisplayString	User Defined max 63 characters	W	ssecret
Response Time (sec)	Integer	1 – 4 seconds 3 sec (default)	RW	responsetm
Maximum Retransmissions (optional)	Integer	1 – 10 3 (default)	RW	maxretx

VLAN/SSID Parameters

NOTE:
For Dual-radio APs: APs with an 11a Upgrade Kit or 802.11b/g Kit support up to 16 VLAN/SSID pairs. APs with an 802.11b PC Card or a 5 GHz Upgrade Kit support only one VLAN/SSID per radio.

Name	Type	Values	Access	CLI Parameter
VLAN	Group	N/A	R	vlan
Status	Integer	enable disable (default)	RW	vlanstatus
Management ID	VlanId	-1 (untagged) or 1-4094	RW	vlanmgmtid

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VLAN ID Table

Name	Type	Values	Access	CLI Parameter
VLAN ID Table	Table	N/A	R	vlanidtbl
Index[1]	Integer32	3.1 - 3.16 (Wireless A); 4.1 - 4.16 (Wireless B; Dual-radio APs only)	R	index
Identifier (ID)	VlanId	-1 or 0 (both correspond to untagged) or 1-4094	RW	id
Network Name (SSID)	DisplayString	1-32 characters	RW	ssid
Status	Integer	enable (default when new entry created) disable delete	RW	status

NOTE:
When adding a new entry to the table, you must specify the index instance you want to configure, such as **3.5**; the **0** index value is not applicable to this table and does not create a new entry.

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Other Parameters

IAPP Parameters

Name	Type	Values	Access	CLI Parameter
IAPP	Group	N/A	R	iapp
IAPP Status	Integer	enable (default) disable	RW	iappstatus
Periodic Announce Interval (seconds)	Integer	80 120 (default) 160 200	RW	iappannint
Announce Response Time	Integer	2 seconds	R	iappannresp
Handover Time-out	Integer	410 ms 512 ms (default) 614 ms 717 ms 819 ms	RW	iapphandtout
Max. Handover Retransmissions	Integer	1 - 4 (default 4)	RW	iapphandretx
Send Announce Request on Startup	Integer	enable (default) disable	RW	iappannreqstart

NOTE:
These parameters configure the Inter Access Point Protocol (IAPP) for roaming. Leave these settings at their default value unless a technical representative asks you to change them.

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SpectraLink VoIP Parameters (802.11b Only)

Name	Type	Values	Access	CLI Parameter
Spectralink VoIP	Group	N/A	R	spectralink
Spectralink VoIP Status	Integer	enable disable (default)	RW	speclinkstatus

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ASCII Character Chart B

Description

You can configure WEP Encryption Keys in either Hexadecimal or ASCII format. Hexadecimal digits are 0-9 and A-F (not case sensitive). ASCII characters are 0-9, A-F, a-f (case sensitive), and punctuation marks. Each ASCII character corresponds to two hexadecimal digits.

The table below lists the ASCII characters that you can use to configure WEP Encryption Keys. It also lists the Hexadecimal equivalent for each ASCII character.

ASCII Character	Hex Equivalent	ASCII Character	Hex Equivalent	ASCII Character	Hex Equivalent	ASCII Character	Hex Equivalent
!	21	9	39	Q	51	i	69
"	22	:	3A	R	52	j	6A
#	23	;	3B	S	53	k	6B
$	24	<	3C	T	54	l	6C
%	25	=	3D	U	55	m	6D
&	26	>	3E	V	56	n	6E
'	27	?	3F	W	57	o	6F
(	28	@	40	X	58	p	70
)	29	A	41	Y	59	q	71
*	2A	B	42	Z	5A	r	72
+	2B	C	43	[	5B	s	73
,	2C	D	44	\	5C	t	74
-	2D	E	45	]	5D	u	75

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ASCII Character	Hex Equivalent	ASCII Character	Hex Equivalent	ASCII Character	Hex Equivalent	ASCII Character	Hex Equivalent
.	2E	F	46	^	5E	v	76
/	2F	G	47	_	5F	w	77
0	30	H	48	`	60	x	78
1	31	I	49	a	61	y	79
2	32	J	4A	b	62	z	7A
3	33	K	4B	c	63	{	7B
4	34	L	4C	d	64	|	7C
5	35	M	4D	e	65	}	7D
6	36	N	4E	f	66	~	7E
7	37	O	4F	g	67		
8	38	P	50	h	68		

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Specifications

C

In This Appendix

- Software Features
- Hardware Specifications
- Radio Specifications

Software Features

The tables below compare the software features available depending on the card type in the Access Point:

- Number of Stations per BSS
- Management Functions
- Advanced Bridging Functions
- Medium Access Control (MAC) Functions
- Security Functions
- Network Functions
- Advanced Wireless Functions

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Number of Stations per BSS

Feature	AP-3 802.11b card	AP-3 5GHz Kit	AP-3 11a Kit	AP-3 802.11b/g card
Without encryption	up to 250	up to 250	up to 250	up to 250
With WEP encryption	up to 250	up to 60	up to 120	up to 120
With 802.1x Authentication	up to 50	up to 44	up to 88	up to 88
With WPA	N/A	N/A	up to 27	up to 27

Management Functions

Feature	802.11b	802.11a	802.11b/g
Web User Interface	yes	yes	yes
Telnet / CLI	yes	yes	yes
SNMP Agent	yes	yes	yes
TFTP	yes	yes	yes

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Advanced Bridging Functions

Feature	802.11b	802.11a	802.11b/g
IEEE 802.1d Bridging	yes	yes	yes
WDS Relay	yes	—	—
Roaming	yes	yes	yes
Protocol Filtering	yes	yes	yes
Multicast/Broadcast Storm Filtering	yes	yes	yes
Proxy ARP	yes	yes	yes
TCP/UDP Port Filtering	yes	yes	yes
Blocking Intra BSS Clients	yes	yes	yes
Packet Forwarding	yes	yes	yes

Medium Access Control (MAC) Functions

Feature	802.11b	802.11a	802.11b/g
Automatic Channel Selection (ACS)	yes	yes	yes
Dynamic Frequency Selection (DFS) [1]	N/A	yes	N/A
Closed System Feature	yes	yes	yes

Note 1: A user cannot manually select a channel for products sold in Europe; these products require automatic channel selection using Dynamic Frequency Selection (DFS).

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Security Functions

Feature	802.11b	802.11a	802.11b/g
IEEE 802.11 WEP [1]	yes	yes	yes
MAC Access Control	yes	yes	yes
RADIUS MAC-based Access Control	yes	yes	yes
IEEE 802.1x Authentication [2]	yes	yes	yes
Per User Per Session (PUPS) Encryption [3]	—	yes	yes
Wi-Fi Protected Access (WPA)	—	—	yes

Note 1: Key lengths supported by 802.11a: 64-bit, 128-bit, and 152-bit.
Key lengths supported by 802.11b: 64-bit and 128-bit.
Key lengths supported by 802.11b/g: 64-bit, 128-bit, and 152-bit.

Note 2: EAP-MD5, EAP-TLS, EAP-TTLS, and PEAP client supplicant supported.

Note 3: Use in conjunction with WPA or 802.1x Authentication.

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Network Functions

Feature	802.11b	802.11a	802.11b/g
DHCP Client	yes	yes	yes
DHCP Server	yes	yes	yes
Inter Access Point Protocol (IAPP)	yes	yes	yes
Link Integrity	yes	yes	yes
System Logging (Syslog)	yes	yes	yes
RADIUS Accounting Support [1]	yes	yes	yes
DNS Client	yes	yes	yes
TCP/IP Protocol Support	yes	yes	yes
Virtual LAN Support	One VLAN ID per wireless interface	**11a Upgrade Kit:** Up to 16 VLAN IDs per wireless interface **5 GHz Upgrade Kit:** One VLAN ID per wireless Interface	Up to 16 VLAN IDs per wireless interface

Note 1: Includes Fallback to Primary RADIUS Server, RADIUS Session Timeout, RADIUS Multiple MAC Address Formats, RADIUS DNS Host Name Support, RADIUS Start/Stop Accounting.

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Advanced Wireless Functions

Feature	802.11b	802.11a	802.11b/g
WEP Plus (Weak Key Avoidance)	yes	—	—
Remote Link Test	yes	—	—
Link Test Responder	yes	—	—
Load Balancing	yes	—	—
AP List	yes	—	—
Medium Density Distribution	yes	—	—
Distance between APs	yes	—	—
Interference Robustness	yes	—	—
SpectraLink VoIP Support	yes	—	—

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Hardware Specifications

Physical Specifications

AP-3 Unit

Dimensions (H x W x L) = 6.5 x 18.5 x 26 cm (2.5 x 7.25 x 10.25 in.)
Weight = 1.75 Kg (3.5 lb.)

802.11a Antenna Adapter

Dimensions (H x W x L) = 11.3 x 2.10 x 26.2 cm (4.5 x 0.83 x 10.3in.)
Weight = 0.18kg (0.4lb)

Electrical Specifications

Without Active Ethernet Module

Voltage = 100 to 240 VAC (50-60 Hz)
Current = 0.2 amp
Power Consumption = 20 Watts

With Active Ethernet Module

Input Voltage = 42 to 60 VDC
Output Current = 200mA at 48V
Power Consumption = 9-10 Watts

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Environmental Specifications

AP-3 Unit

Operating = 0° to 40°C (32° to 104 °F) @ 20 to 90% relative humidity
Transport = -40° to 60°C (-40° to 140°F) @ 15 to 95% relative humidity (no condensation allowed)
Storage = -10° to 60°C (14° to 140°F) @ 10 to 90% relative humidity (no condensation allowed)

802.11a Antenna Adapter

Operating = 0° to 70°C (32° to 158 °F) @ 20 to 90% relative humidity
Transport = -40° to 75°C (-40° to 167 °F) @ 15 to 95% relative humidity
Storage = -20° to 75°C (-4° to 167 °F) @ 10 to 95% relative humidity

Ethernet Interface

10/100 Base-TX, RJ-45 female socket

Serial Port Interface

Standard RS-232C interface with DB-9, female connector

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Active Ethernet Interface

Category 5, foiled, twisted pair cables must be used to ensure compliance with FCC Part 15, subpart B,
Class B requirements

Standard 802.3af pin assignments

HTTP Interface

- Microsoft Internet Explorer 6 with Service Pack 1 or later
- Netscape 6.1 or later

Radio Specifications

- 802.11a Channel Frequencies
- 802.11b Channel Frequencies
- 802.11g Channel Frequencies
- Wireless Communication Range

NOTE:
Refer to the Regulatory Flyer included with the AP for the latest regulatory information.

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802.11a Channel Frequencies

The available 802.11a Channels varies by regulatory domain and/or country. 802.11a radio certification is available in the following regions:

- FCC: U.S., Canada, and Australia
- ETSI: Europe and the United Kingdom
- MKK: Japan
- SG: Singapore
- ASIA: China, Hong Kong, and South Korea
- TW: Taiwan

There are five sets of frequency bands that determine the available channels depending on the regulatory domain.

Some countries restrict 802.11a operation to specific frequency bands. The Web interface and CLI display the available channels for a radio's particular regulatory domain. In the CLI, any channels that are not available are labeled "Not Supported".

NOTE:
The original 5 GHz Upgrade Kit only supports the Lower and Middle U-NII bands. The 11a Upgrade Kit supports all of the frequency bands described below.

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Frequency Band	Channel ID	FCC (GHz)	ETSI (GHz)	MKK (GHz)	SG (GHz)	ASIA (GHz)	TW (GHz)
Lower Band (36 = default)	34	—	—	5.170 [1]	—	—	—
	36	5.180	5.180	—	5.180	—	—
	38	—	—	5.190	—	—	—
	40	5.200	5.200	—	5.200	—	—
	42	—	—	5.210	—	—	—
	44	5.220	5.220	—	5.220	—	—
	46	—	—	5.230	—	—	—
	48	5.240	5.240	—	5.240	—	—
Middle Band (52 = default)	52	5.260	5.260	—	—	—	5.260
	56	5.280	5.280	—	—	—	5.280
	58	5.300	5.300	—	—	—	5.300
	60	5.320	5.320	—	—	—	5.320
H Band	100	—	5.500	—	—	—	—
	104	—	5.520	—	—	—	—
	108	—	5.540	—	—	—	—
	112	—	5.560	—	—	—	—
	116	—	5.580	—	—	—	—
	120	—	5.600	—	—	—	—
	124	—	5.620	—	—	—	—
	128	—	5.640	—	—	—	—
	132	—	5.660	—	—	—	—
	136	—	5.680	—	—	—	—
	140	—	5.700	—	—	—	—
Upper Band (149 = default)	149	5.745	—	—	5.745	5.745	5.745
	153	5.675	—	—	5.675	5.675	5.675
	157	5.785	—	—	5.785	5.785	5.785
	161	5.805	—	—	5.805	5.805	5.805
ISM Band	165	5.825	—	—	5.825	—	5.825

Note 1: Channel 34 is the default channel for Japan

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802.11b Channel Frequencies

The available 802.11b channels vary by regulatory domain and/or country. 802.11b radio certification is available in the following regions:

- FCC - U.S./Canada, Mexico, and Australia
- ETSI - Most of Europe, including the United Kingdom and some Eastern block countries
- MKK - Japan
- IL - Israel

Some countries restrict 802.11b operation to specific frequency bands. The web interface will always display the available channels depending in the cards regulatory domain. In the CLI, any channels that are not available are labeled "Not Supported".

Channel ID	FCC (GHz)	ETSI (GHz)	MKK (GHz)	IL (GHz)
1	2.412	2.412	2.412	-
2	2.417	2.417	2.417	-
3	2.422	2.422	2.422	-
4	2.427	2.427	2.427	2.427
5	2.432	2.432	2.432	2.432
6	2.437	2.437	2.437	2.437
7	2.442	2.442	2.442	2.442
8	2.447	2.447	2.447	2.447
9	2.452	2.452	2.452	-
10	2.457	2.457[1]	2.457	-
11	2.462	2.462[1]	2.462	-
12	-	2.467[1]	2.467	-

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Channel ID	FCC (GHz)	ETSI (GHz)	MKK (GHz)	IL (GHz)
13	-	2.472[1]	2.472	-
14	-	-	2.484	-

Note 1: France is restricted to these four channels.

802.11g Channel Frequencies

The available 802.11g channels vary by regulatory domain and/or country. 802.11g radio certification is available in the following regions:

- FCC - U.S./Canada, Mexico, and Australia
- ETSI - Europe and the United Kingdom
- ETSI - Europe, including the United Kingdom, China, and South Korea
- MKK - Japan
- IL - Israel

Some countries restrict 802.11g operation to specific frequency bands. The web interface will always display the available channels depending in the cards regulatory domain. In the CLI, any channels that are not available are labeled "Not Supported".

Channel ID	FCC (GHz)	ETSI (GHz)	MKK (GHz)	IL (GHz)
1	2.412	2.412	2.412	-
2	2.417	2.417	2.417	-
3	2.422	2.422	2.422	-

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Channel ID	FCC (GHz)	ETSI (GHz)	MKK (GHz)	IL (GHz)
4	2.427	2.427	2.427	2.427
5	2.432	2.432	2.432	2.432
6	2.437	2.437	2.437	2.437
7	2.442	2.442	2.442	2.442
8	2.447	2.447	2.447	2.447
9	2.452	2.452	2.452	-
10	2.457	2.457[1]	2.457	-
11	2.462	2.462[1]	2.462	-
12	-	2.467[1]	2.467	-
13	-	2.472[1]	2.472	-
14	-	-	2.484[2]	-

Note 1: France is restricted to these channels.

Note 2: Channel 14 is only available when using **802.11b only** mode.

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Wireless Communication Range

The range of the wireless signal is related to the composition of objects in the radio wave path and the transmit rate of the wireless communication. Communications at a lower transmit range may travel longer distances. The range values listed in the Communications Range Chart are typical distances as calculated by Avaya's development team for FCC-certified products. These values provide a rule of thumb and may vary according to the actual radio conditions at the location where the product is used.

The range of your wireless devices can be affected when the antennas are placed near metal surfaces and solid high-density materials. Range is also impacted due to "obstacles" in the signal path of the radio that may either absorb or reflect the radio signal.

In Open Office environments, antennas can "see" each other (no physical obstructions between them). In Semi-open Office environments, workspace is divided by shoulder-height, hollow wall elements; antennas are at desktop level. In a Closed Office environment, solid walls and other obstructions may affect signal strength.

The following tables show typical range values for various environments for FCC-certified products (range may differ for products certified in other regulatory domains).

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802.11b Wireless Communication Ranges

Range	11 Mbits/s	5.5 Mbits/s	2 Mbits/s	1 Mbits/
Open Office	142 m (466 ft.)	177 m (581 ft.)	219 m (718 ft.)	272 m (892 ft.)
Semi-Open Office	98 m (322 ft.)	122 m (400 ft.)	151 m (495 ft.)	187 m (614 ft.)
Closed Office	67 m (220 ft.)	84 m (276 ft.)	104 m (341 ft.)	129 m (423 ft.)
Tx Power	15	15	15	15
Receiver Sensitivity (dBm)	-82	-85	-88	-91
Antenna Gain	0 dBi (integrated diversity antenna module; 2.4-2.5 GHz)			

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802.11a (5 GHz Upgrade Kit) Wireless Communication Ranges

Range	54 Mbits/s	48 Mbits/s	36 Mbits/s	24 Mbits/s	18 Mbits/s	12 Mbits/s	9 Mbits/s	6 Mbits/s
Open Office	19 m (62 ft.)	33 m (108 ft.)	55 m (180 ft.)	74 m (243 ft.)	92 m (302 ft.)	106 m (348 ft.)	122 m (400 ft.)	131 m (430 ft.)
Semi-Open Office	13 m (43 ft.)	23 m (75 ft.)	38 m (125 ft.)	51 m (167 ft.)	63 m (207 ft.)	73 m (239 ft.)	84 m (276 ft.)	90 m (295 ft.)
Closed Office	9 m (30 ft.)	16 m (52 ft.)	26 m (85 ft.)	35 m (115 ft.)	43 m (141 ft.)	50 m (164 ft.)	58 m (190 ft.)	62 m (203 ft.)
Tx Power (dBm)	7	11	14	14	14	14	14	14
Receiver Sensitivity (dBm)	-65	-69	-73	-77	-80	-82	-84	-85
Antenna Gain	3.5 dBi (integrated diversity antennas; 5.15-5.35 GHz)							

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802.11a (11a Upgrade Kit) Wireless Communication Ranges

Range	54 Mbits/s	48 Mbits/s	36 Mbits/s	24 Mbits/s	18 Mbits/s	12 Mbits/s	9 Mbits/s	6 Mbits/s
Open Office	46 m (151 ft.)	62 m (203 ft.)	82 m (269 ft.)	110 m (361 ft.)	136 m (446 ft.)	169 m (554 ft.)	181 m (594 ft.)	195 m (640 ft.)
Semi-Open Office	32 m (105 ft.)	42 m (138 ft.)	57 m (187 ft.)	75 m (246 ft.)	94 m (308 ft.)	116 m (381 ft.)	125 m (410 ft.)	134 m (440 ft.)
Closed Office	22 m (72 ft.)	29 m (95 ft.)	39 m (128 ft.)	52 m (171 ft.)	64 m (210 ft.)	80 m (262 ft.)	86 m (282 ft.)	92 m (302 ft.)
Tx Power (dBm)	15	15	15	15	15	15	15	15
Receiver Sensitivity (dBm)	-69	-73	-77	-81	-84	-87	-88	-89
Antenna Gain	4 dBi (integrated diversity antennas; 5.15-5.85 GHz)							

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802.11b/g Wireless Communication Ranges

Range	54 Mbits/s	48 Mbits/s	36 Mbits/s	24 Mbits/s	18 Mbits/s	12 Mbits/s
Open Office	56 m (184 ft.)	69 m (226 ft.)	107 m (351 ft.)	164 m (538 ft.)	219 m (718 ft.)	272 m (892 ft.)
Semi-Open Office	38 m (125 ft.)	48 m (157 ft.)	73 m (239 ft.)	113 m (371 ft.)	151 m (495 ft.)	187 m (614 ft.)
Closed Office	26 m (85 ft.)	33 m (108 ft.)	51 m (167 ft.)	78 m (256 ft.)	104 m (341 ft.)	129 m (423 ft.)
Tx Power (dBm)	12	13	14	15	15	15
Receiver Sensitivity (dBm)	-68	-70	-75	-80	-84	-87
Antenna Gain 3 dBi (integrated diversity antenna module; 2.4-2.5 GHz)						

Range	9 Mbits/s	6 Mbits/s	11 Mbits/s	5.5 Mbits/s	2 Mbits/s	1 Mbits/s
Open Office	292 m (958 ft.)	314 m (1030 ft.)	204 m (669 ft.)	236 m (774 ft.)	253 m (830 ft.)	338 m (1109 ft.)
Semi-Open Office	201 m (659 ft.)	216 m (709 ft.)	140 m (459 ft.)	162 m (531 ft.)	174 m (571 ft.)	232 m (761 ft.)
Closed Office	138 m (453 ft.)	149 m (489 ft.)	97 m (318 ft.)	111 m (364 ft.)	120 m (394 ft.)	160 m (525 ft.)
Tx Power (dBm)	15	15	15	15	15	15

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Receiver Sensitivity (dBm)	-88	-89	-83	-85	-86	-90
Antenna Gain 3 dBi (integrated diversity antenna module; 2.4-2.5 GHz)						

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Technical Support D

Before You Seek Help

If you are having a problem using an AP and cannot resolve it with the information in Troubleshooting, gather the following information and contact your local authorized reseller or visit http://www.avaya.com/support for contact information:

- List of Avaya Wireless products installed on your network; include the following:
  - — Product names and quantity
  - — Part numbers (P/N)
  - — Serial numbers (S/N)
- List of Avaya Wireless software versions installed
  - — For the AP, check the HTTP interface's Version screen
  - — Include the source of the software version (e.g., pre-loaded on unit, installed from CD, downloaded from Avaya Web site, etc.)

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- Information about your network
  - — Network operating system (e.g., Microsoft Networking); include version information
  - — Protocols used by network (e.g., TCP/IP, NetBEUI, IPX/SPX, AppleTalk)
  - — Ethernet frame type (e.g., 802.3, Ethernet II), if known
  - — IP addressing scheme (include address range and whether static or DHCP)
  - — Network speed and duplex (10 or 100 Mbits/sec; full or half duplex)
  - — Type of Ethernet device that the Access Points are connected to (e.g., Active Ethernet power injector, hub, switch, etc.)
  - — Type of Security enabled on the wireless network (None, WEP Encryption, 802.1x, Mixed)
- A description of the problem you are experiencing
  - — What were you doing when the error occurred?
  - — What error message did you see?
  - — Can you reproduce the problem?
  - — For each Avaya Wireless product, describe the behavior of the device's LEDs when the problem occurs

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